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# TRENDS IN INDUSTRY AND EMPLOYMENT

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# PENNSYLVANIA
# TRENDS IN INDUSTRY AND EMPLOYMENT
# 1916-1955

REVISED EDITION

COMMONWEALTH OF PENNSYLVANIA
STATE PLANNING BOARD
GOVERNOR'S OFFICE
1957

# TRENDS IN INDUSTRY AND EMPLOYMENT IN PENNSYLVANIA

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# INTRODUCTION

In a world experiencing such huge and unpredictable stresses as those which have been developing within the last three decades, the prediction of future changes is a task of enormous difficulty and any conclusions based altogether on precedents are subject to unusual doubt. This does not mean, however, that Pennsylvania industry, as a whole or for any particular type of manufacture, is left entirely in the dark as to its prospects, for that would be far from true. The past record of changes in any type of production may usually be regarded as the resultant of economic forces which are normally extremely persistent. It must, however, be recognized that economic forces have only rarely the kind of inevitability characteristic of physical forces beyond human control.

As a matter of fact, economic forces are predominantly psychological. They represent the result of human reactions to the changing conditions of our environment. Those reactions are sometimes logical and predictable and sometimes highly emotional and unpredictable. As a consequence, the naive projection of lines on a chart neither condemns nor promises an inevitable future. Men have changed, and always will be able to change an unfavorable future into a fortunate one and just as certainly, by their own negligence or folly, may turn a good and justified hope into a story of disaster. It is, in the light of these observations, that the charts, embodied in this record of Pennsylvania's industry, should be interpreted.

## SOURCES OF DATA

The data made use of in this survey of Pennsylvania industrial employment and production are derived from several sources but principally from the reports of the Department of Internal Affairs, covering the period from 1916 through 1955. The classification of industry employed in these records does not always agree with that adopted by the U. S. Census of Manufactures. It is believed, however, that the records as given here or as illustrated in the accompanying charts are substantially consistent within each series and that the statistical values illustrated present an undistorted picture.

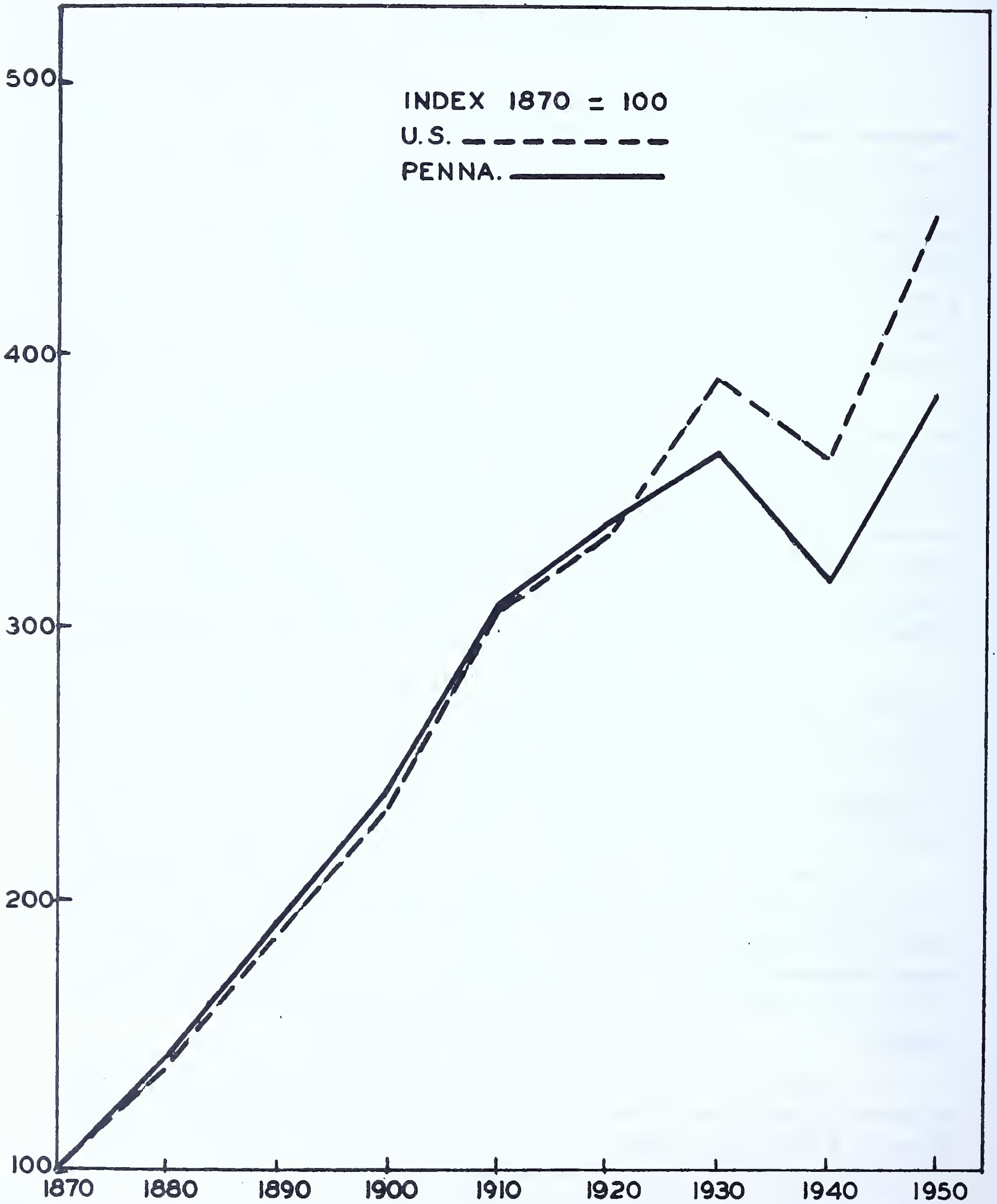
In dealing with comparisons between Pennsylvania and the Nation as a whole, it has been necessary that year to year data be sometimes drawn from two quite different sources, such as the employment records of the Pennsylvania Department of Internal Affairs and the national records of the Bureau of Labor Statistics. However, each such series -- that of the State or the Nation is generally consistent within itself except for minor changes of definition which are unlikely to have affected the direction or force of long-term trends.

In general, the employment record of the five years from 1916 to 1920, inclusive, has been used as the basis for index numbers. In certain instances, exceptions have been made to this general practice where new factors have altered the character of an industrial group and a reference back to earlier conditions would be more deceptive than helpful or where earlier records than those given are not available.

Because of the changing value of money, these records are in general based only on employment except where technological progress makes the volume of production a matter of particular interest. The number employed in each industry or component is indicated on the trend lines as of 1955 and, in some cases, at critical points in the past records.

The charts used to illustrate the trend of employment were prepared by Mrs. Mary Moody and Mrs. Florence Vinyard of the State Planning Board staff. Thanks are due to Dr. Kenneth W. Masters, Director of the Bureau of Statistics, Department of Internal Affairs, for his generous cooperation in providing needed data.

# INDICES OF INDUSTRIAL EMPLOYMENT
## 1870-1950



STATE PLANNING BOARD
CHART I

## PATTERNS OF INDUSTRIAL GROWTH - Charts I to VIII

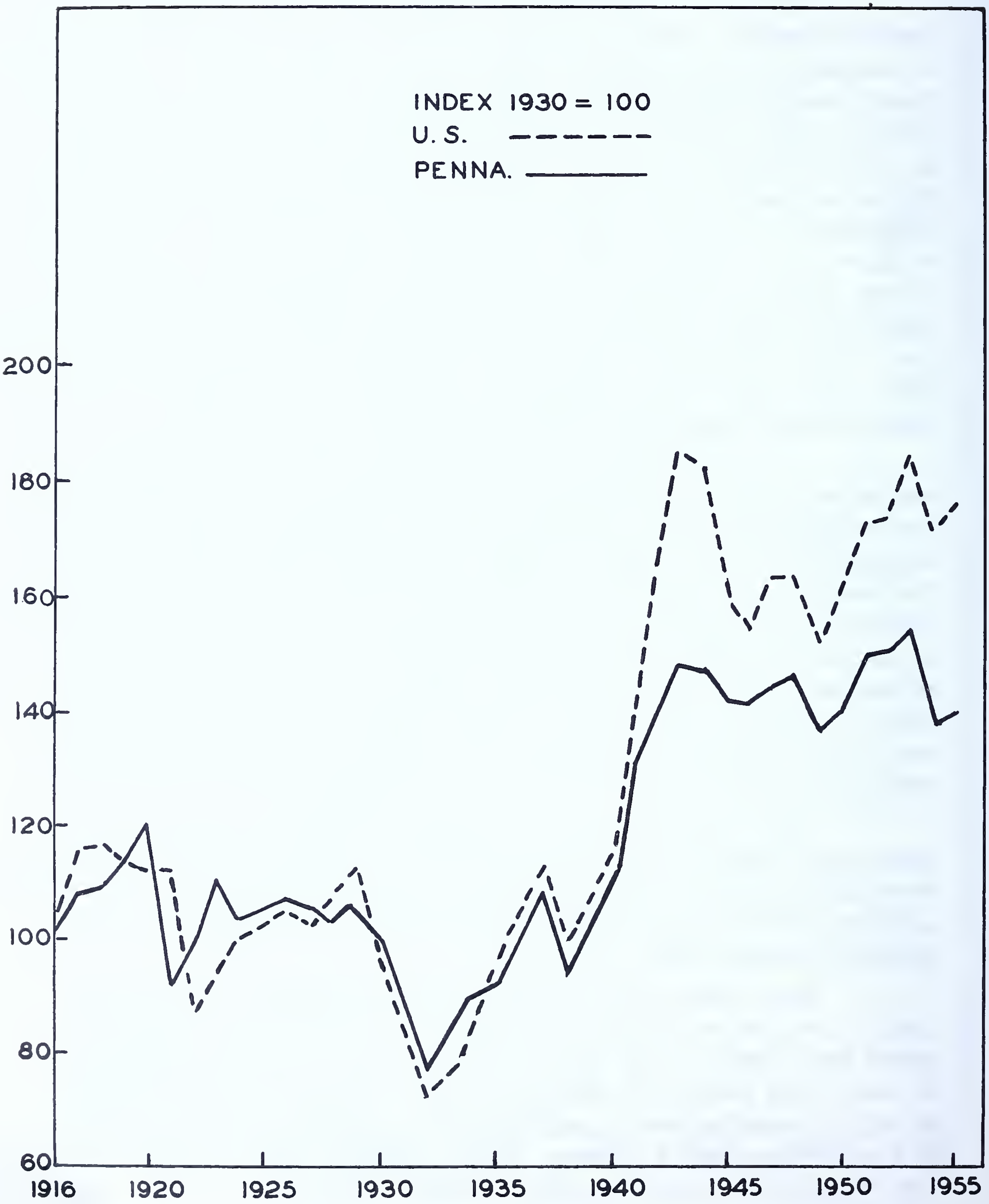
A study of Pennsylvania's industrial trends throughout the Twentieth Century reveals a fact which is apparently, but not actually, discouraging as to the future. The fact is unquestionable. In 1899, Pennsylvania's manufacturing wage earners were 14.1% of the United States' total. By 1939, this proportion had gradually shrunk to 10.8%, by 1947 to 10.2% and by 1953, according to a Census estimate, to 9.3%. During the same period, Pennsylvania manufacturing wages, while rising dramatically from $297,000,000 in 1899 to $6,288,730,000 in 1953, declined from 14.8% to 9.2% of the United States' total. It is, of course, possible to consider this decline in the proportion of Pennsylvania's employment and wages to the national total to be evidence of a lack of progress in the Commonwealth, but the percentage figures may also, and perhaps more reasonably, be interpreted as evidence of the growth and development of our Nation as a whole.

The truth seems to lie somewhere between these two views. During the first 50 years of the Twentieth Century, the population of the United States exhibited an astonishing increase, continuing the strong westward trend begun in 1849. Pennsylvania, among the oldest of the states in its population history and the earliest in extensive industrial development, has contributed very largely to the settlement of the West and, while doing so, has generally, over the past 200 years, maintained a rising standard of living. Some sections of the Commonwealth, however, have not shared in the economic improvement which is evident in most of its industrial and agricultural counties and have experienced a decline in important sources of income and employment.

Such a decline occurred toward the end of the Nineteenth Century in lumbering. Early in the Twentieth Century the production of Pennsylvania petroleum passed its peak and today the anthracite counties and some parts of the bituminous coal regions of the Commonwealth are suffering serious losses in employment.

While Pennsylvania has maintained its dominance in the production of iron and steel and in the metals field generally, it has not shared very largely in the growth of the automotive industries by which so much of the pattern of Twentieth Century living has been shaped and by which a large increase in manufacturing employment has been created. No Pennsylvanian would, however, wish to deny the benefits which have come to our State from expanding industrial development in other areas

# INDICES OF EMPLOYMENT IN MANUFACTURING 1916 — 1955



STATE PLANNING BOARD
CHART II

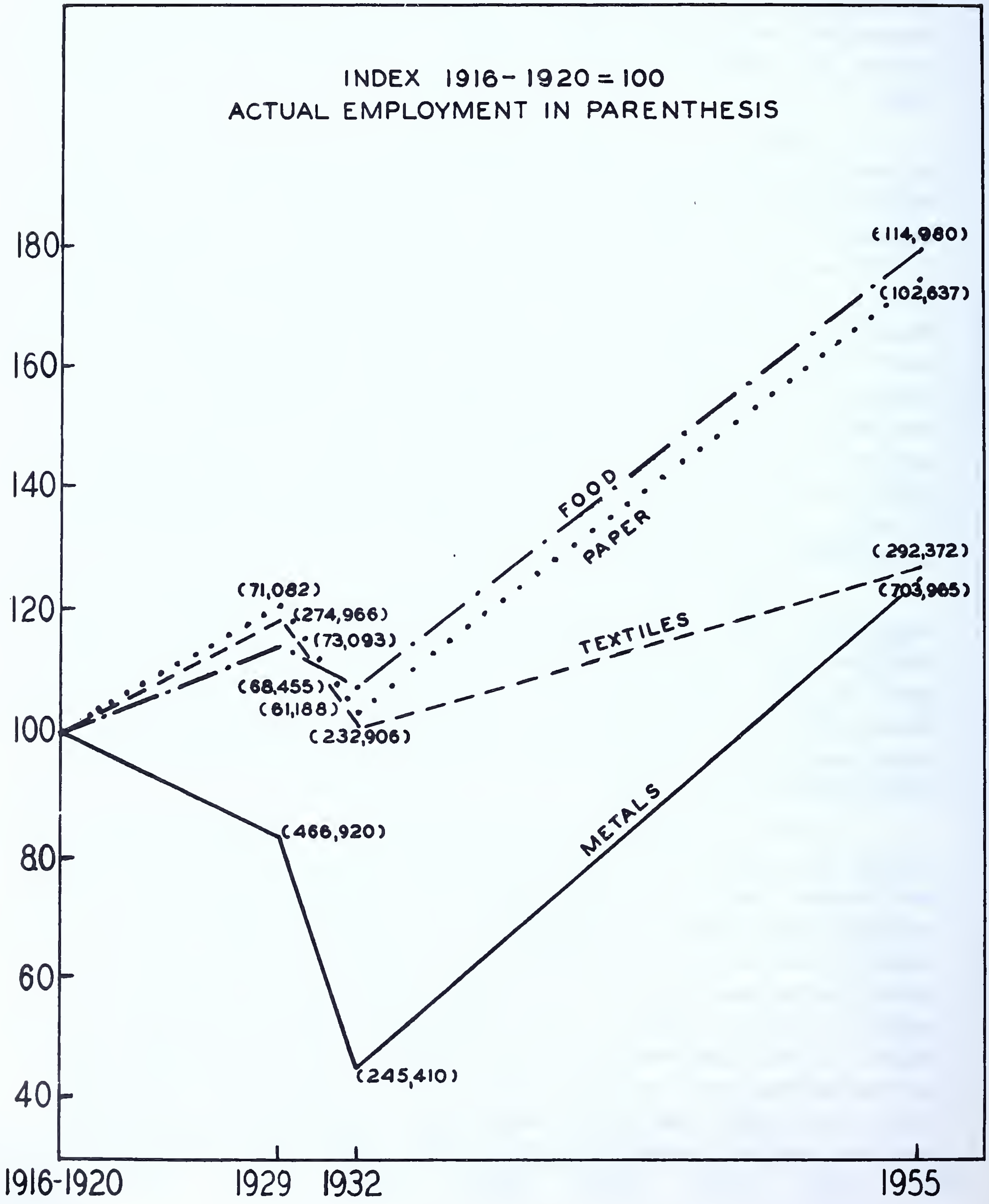
of our country and the consequent growth of markets for our products. During the past 35 years, while our proportion of industrial employment had declined from 12.6% in 1919 to 7.7% in 1954, the value of the State's production, according to the records of the Department of Internal Affairs, has risen from $8,853,000,000 in 1919 to $24,142,580,400 in 1955.

That the gain in employment in Pennsylvania's industries has not kept pace percentage-wise with that of the Nation, does not quite tell the whole story. This fact is illustrated by Chart I where employment in 1870 is taken as 100 on an index series (U. S. Census data). It will be seen that Pennsylvania's relative trend closely paralleled that of the Nation from 1870 to 1910, that the rate of increase in Pennsylvania is somewhat greater between 1910 and 1920 but considerably lower from 1920 to 1930. From that year to 1940, Pennsylvania's relative decline in employment was greater than that of the Nation, and up to 1950 had not recovered its former position. This fact is more clearly indicated in the second chart in this chapter, where the State's employment in manufactures alone, as estimated by the United States Department of Labor, is plotted with that of the United States on a similar index series with 1930 employment as the base.

Of equal significance as the proportion changes that have taken place between the Commonwealth and the Nation, are the changes which have taken place in the industries that make up the economy of the State. The three simplified charts showing the progress of Pennsylvania's industries by major classifications, on an index series, at four critical dates from 1916 to 1955, present in broad outline the nature of the State's industrial patterns.

Chart III shows the four industries with the largest employment. In 1955, the metals and textiles industries employed about 25 per cent more persons than they had in 1916 and both have increased since the depression year 1932. The sharp decline and rapid rise of the metals industry indicates how volatile the production of durable goods and primary metals have proved to be in the past as compared with the manufacture of textile products or the preparation of foods. One factor, of course, in the rapid decline of the metals industries, and their even more astonishing rise, has been the fact that at both ends of this time period (1918-1955), war or the requirements for military preparedness have been dominant demanders in the economy of the Nation. Individuals

# FOUR HIGHEST INDUSTRIES IN EMPLOYMENT 1955



STATE PLANNING BOARD
CHART III

who compare this revised edition of Trends in Industry and Employment with the 1956 edition will note that the steady and sustained growth of the paper and printing industry has pushed it into fourth place, replacing the mining and quarrying industry. The food and kindred products industry and the paper and printing industry each employ approximately 75 per cent more people than they had in 1916-1920.

Chart IV shows employment in the fifth through eighth most important industries; mining and quarrying; clay, glass, and stone products; chemicals; and miscellaneous products. It is evident that the mining industry with its rapid decline of workers from 303,000 in 1929 to 87,900 in 1955 has presented the people of the Commonwealth with an extremely serious problem. The chemical industries which include petroleum refining, like the metal industries, are affected by wartime demands, and so also are the miscellaneous industries which include shipbuilding, the production of aircraft and their parts, and the output of coke and coke by-products as well as numerous less important types of manufacture.

The three industrial groups providing the least employment opportunities in the State, Leather and Rubber, Lumber, and Tobacco represent, on the whole, three quite different types of industrial problem. The Leather and Rubber industries have shown a healthy gain in employment in the past few years. Lumber and Wood Products, an industry in which Pennsylvania once dominated the Nation, paid the penalty of its early success by exhausting its native raw material, the trees of Pennsylvania's forests, but seems today, under the stimulus of the present housing boom and after a generation of forest management on public lands, to be slowly recovering its position. There is, however, relatively little chance that the State can ever regain its once dominant place in lumbering, but it still has important opportunities in the manufacture of fine furniture, mill work and similar products. The downward sloping curve of the tobacco manufactures, similar in general direction to that of mining in Chart IV, does not represent the decadence of a once important industry. As a matter of fact, the value of Pennsylvania's tobacco products, based very largely on the manufacture of cigars from Pennsylvania-grown leaf, has steadily risen for nearly a generation. What the Tobacco curve illustrates is the remarkable progress made in the technology of cigar making which in recent years has greatly increased the unit productivity of labor in this industry.

# FIFTH TO EIGHTH INDUSTRIES IN EMPLOYMENT 1955

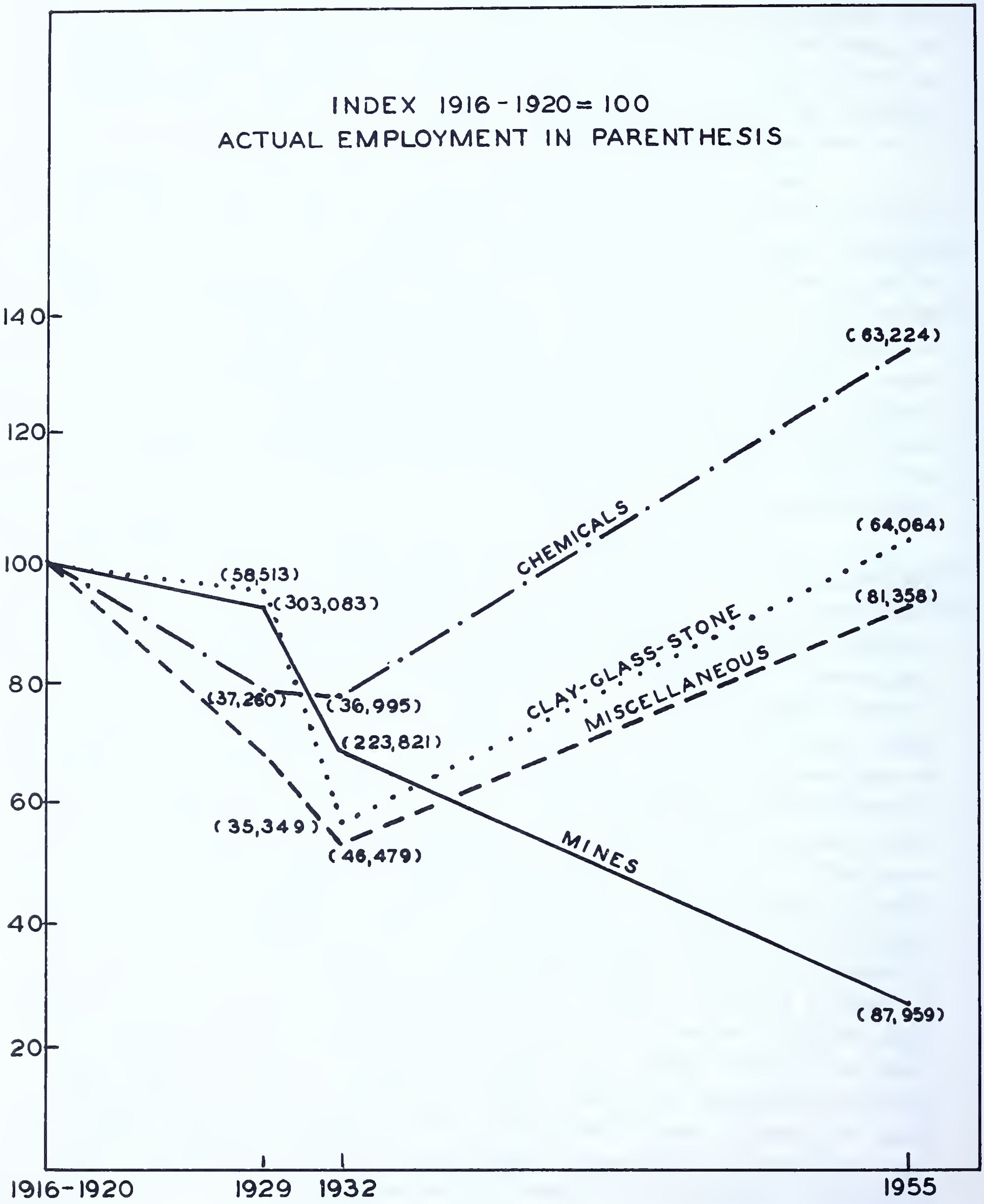


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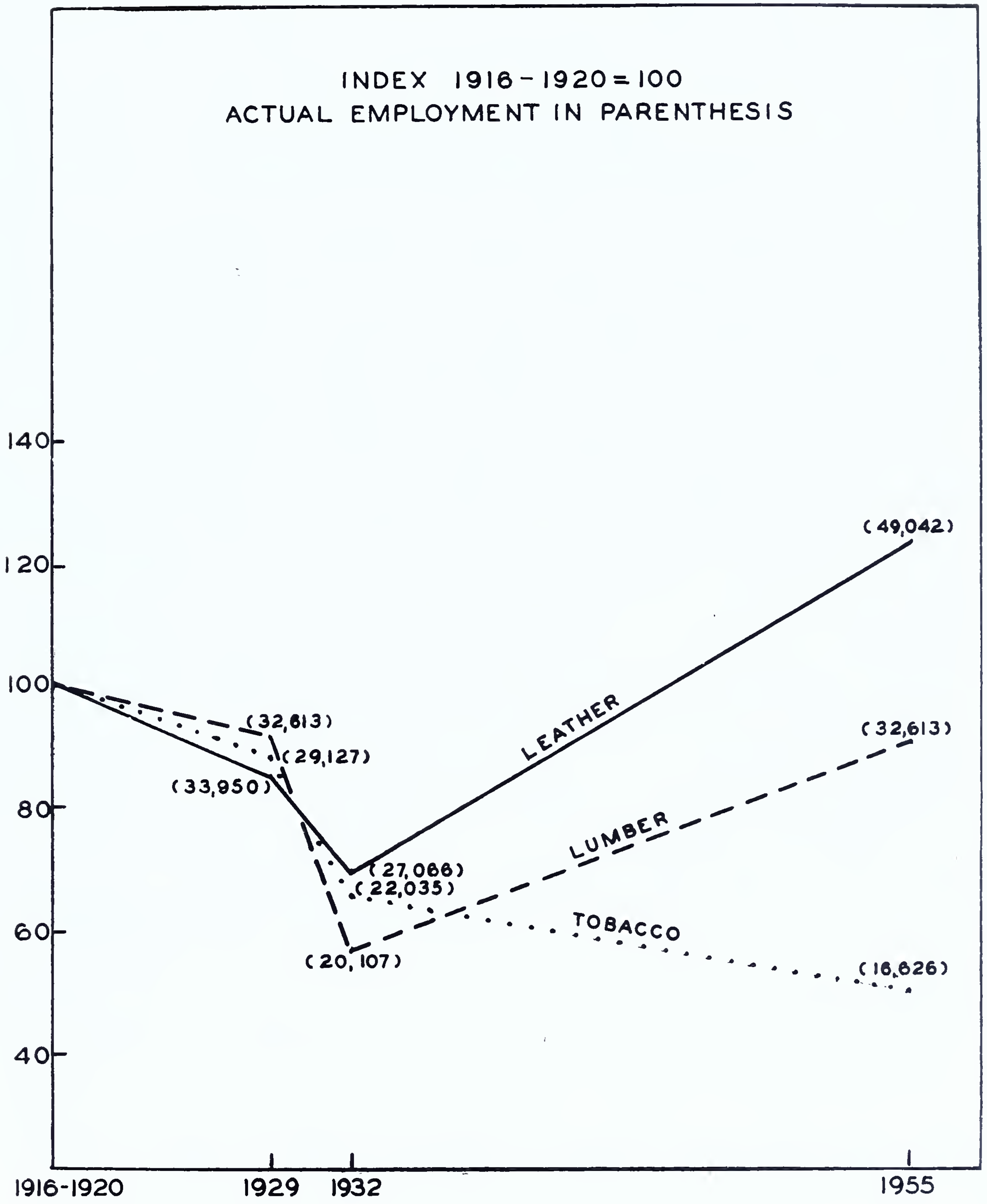
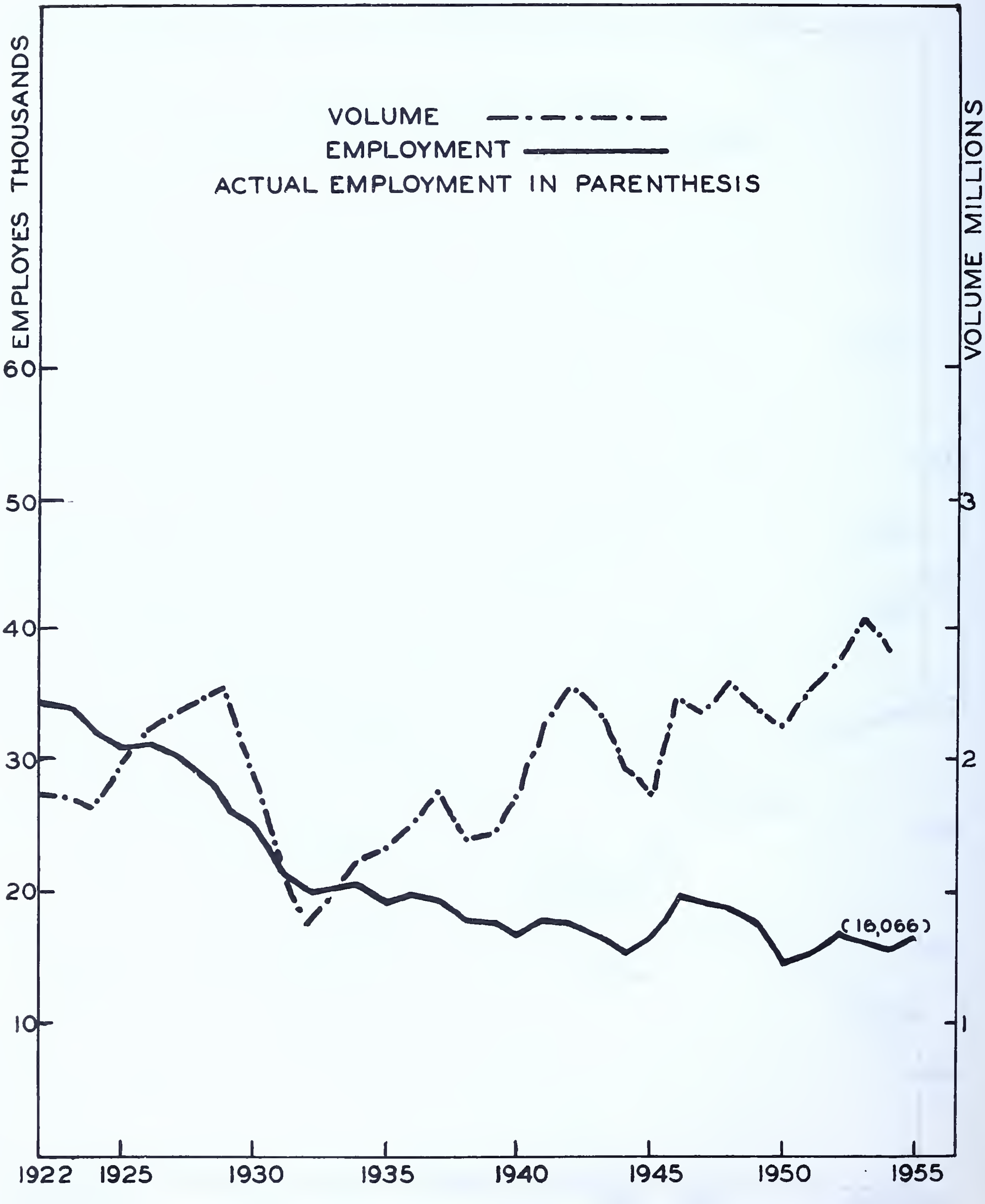
CHART IV

# THREE LOWEST INDUSTRIES IN EMPLOYMENT 1955



STATE PLANNING BOARD
CHART V

# EMPLOYMENT AND PRODUCTION OF CIGARS 1922 — 1955



STATE PLANNING BOARD
CHART VI

A somewhat similar relationship, again very largely due to technological progress, is evident in Chart VII, which shows Pennsylvania employment and volume in the production of silk, rayon and nylon hosiery. In this industry, after a rise from the post-depression low of 1941 to 1950, the volume curve again declined due, in part or wholly, to the loss of a number of units in the hosiery industry to locations in the South, a matter which will be discussed more fully later in this survey.

In the first quarter of the twentieth century, intense competition in the hosiery industry resulted in a series of improvements in knitting machines, both those producing full-fashioned hosiery, which are knitted flat, and those producing the seamless variety, which are knitted in a tubular form. Between 1930 and 1940, technical improvements had overcome the necessity of producing the full-fashioned stocking by three separate operations and a notable increase in output per worker resulted as the new machines went into operation. Other developments have made it possible for each machine to knit as many as sixteen pairs simultaneously and also have greatly increased the speed both of the knitting operation and the subsequent finishing. The effect of these improvements is strikingly illustrated in our chart.

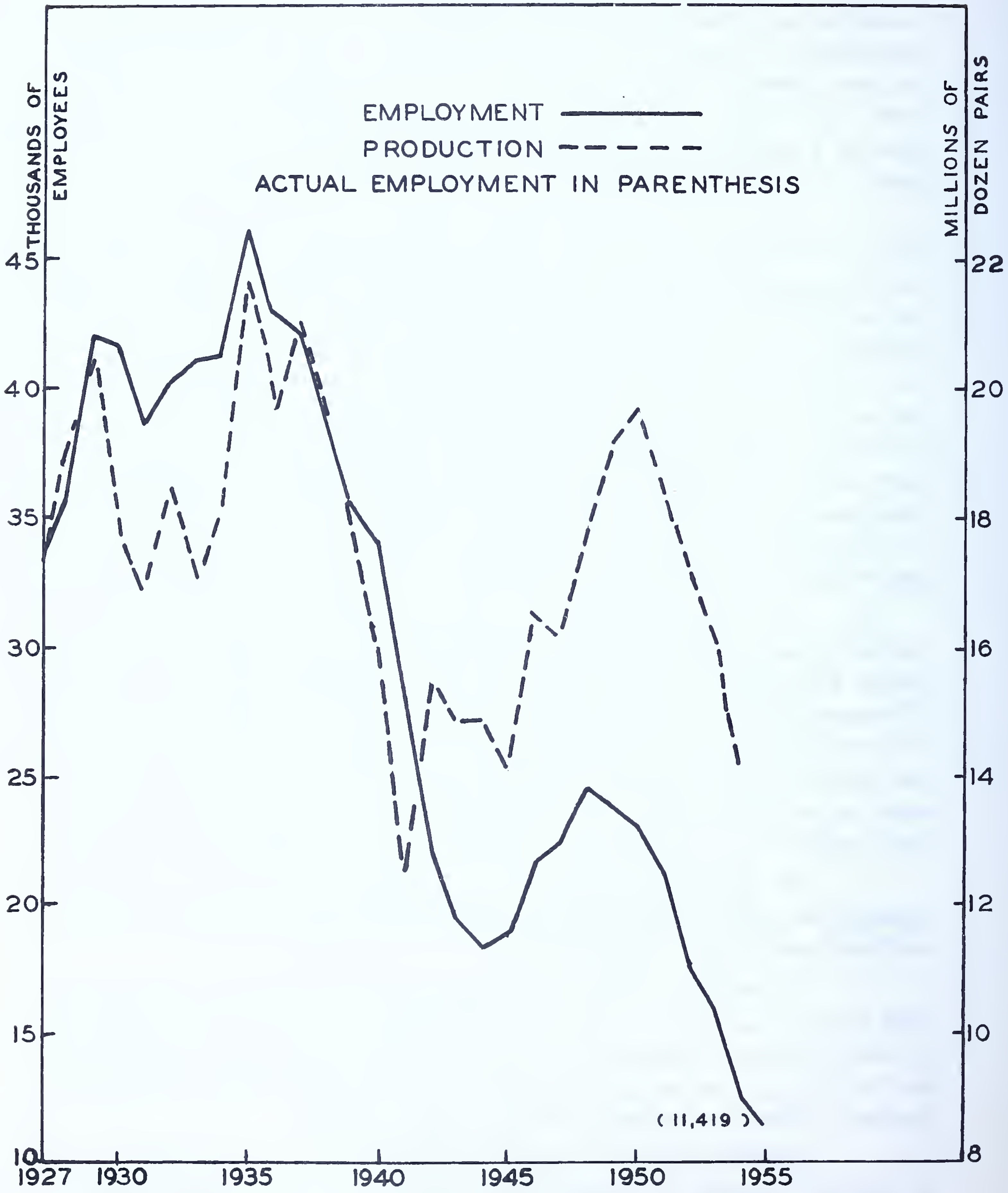
In other instances, as in the production of cement, volume has increased while employment has stabilized during the years following the Second World War. In the case of cement, the increased production has been in response to a steady demand due to the high level of construction activity in the post-war years. Improvements in methods of manufacture including larger kilns, have established a new relationship of output to employment so that both production and the number of workers in the industry have remained at a sustained level during the past six or seven years.

The three instances just illustrated by our charts are indicative of the gains in productivity which are now presenting a serious problem to both labor and management.

It has been obvious for some years that feed-back mechanisms, such as those employed in electronic analogue computers, could be adapted to the direction of elaborate mechanical operations in which both memory and ability to learn by experience are necessary in the system of controls. These developments seem now close at hand.

Extremely critical situations could develop if the process of automation proceeds too rapidly and too little time is allowed for the gradual adjustment and re-training of labor to meet new demands for the

# EMPLOYMENT AND PRODUCTION IN NYLON, SILK AND RAYON HOSIERY
# 1927—1955



STATE PLANNING BOARD
CHART VII

control of high speed production machinery.

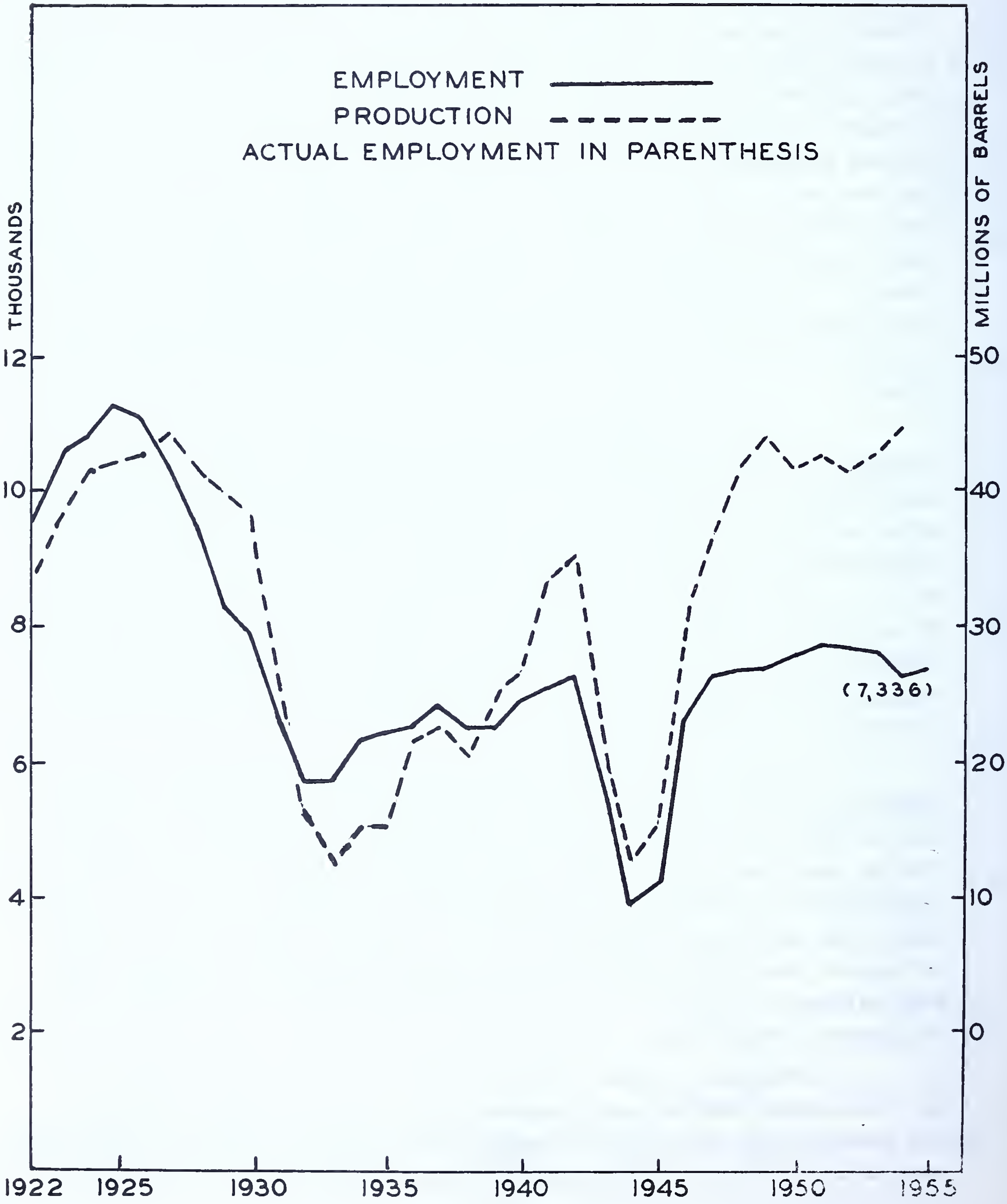
In some industries, it is possible that automatic controls may affect clerical and accounting operations more directly than production processes, and may provide automatic controls of inventory and programming which now consume a large number of man-hours in many plants. It has been maintained that mining and retailing are outside the field of automation, but this does not seem to be a very sound conclusion. The typical super-market has already dispensed with store clerks or salesmen. The Continuous Miner is performing the labor of many men in bituminous coal operations here in Pennsylvania, with constant improvement being made in the efficiency of the machine, so that this whole field offers drastic, and in some ways alarming, possibilities for the substitution, for human labor, of a minimum number of kilowatt-hours, which will neither wear clothes, raise children, demand automobiles or watch television.

It must be remembered, however, that this type of change is not new. The revoluntionary possibilities of automatic control were first made evident by the invention in 1727 of the Jacquard loom, a device which eventually enabled a single operator to control a number of looms producing fabrics whose elaborate patterns had been coded on a punched roll or cards. Barring the possibility of a major war which might greatly accelerate industrial automation, the chances seem good that such changes will occur, industry by industry, and that increased demand will compensate for higher productivity, but the process has already profoundly affected our State's economy.

Automatic power-driven machines, which operate with a limited amount of human direction, are already being manufactured to perform most of the miscellaneous tasks on stock farms, and it seems likely that further applications of power to semi-automatic equipment will involve larger capital expenditures but considerably decrease the need for farm labor. The mechanized farm with its feed grinders, heated water supply for stock, electric conveyors, barn cleaners and similar equipment, will make extremely difficult the competitive operation of the traditional all-purpose family farm.

Certainly, a study of these possibilities and their consequence for educational and training programs is a matter of prime interest to the industry and labor of our Commonwealth. In sight for many lines of manufacture is a period of greatly increased productivity and eventually

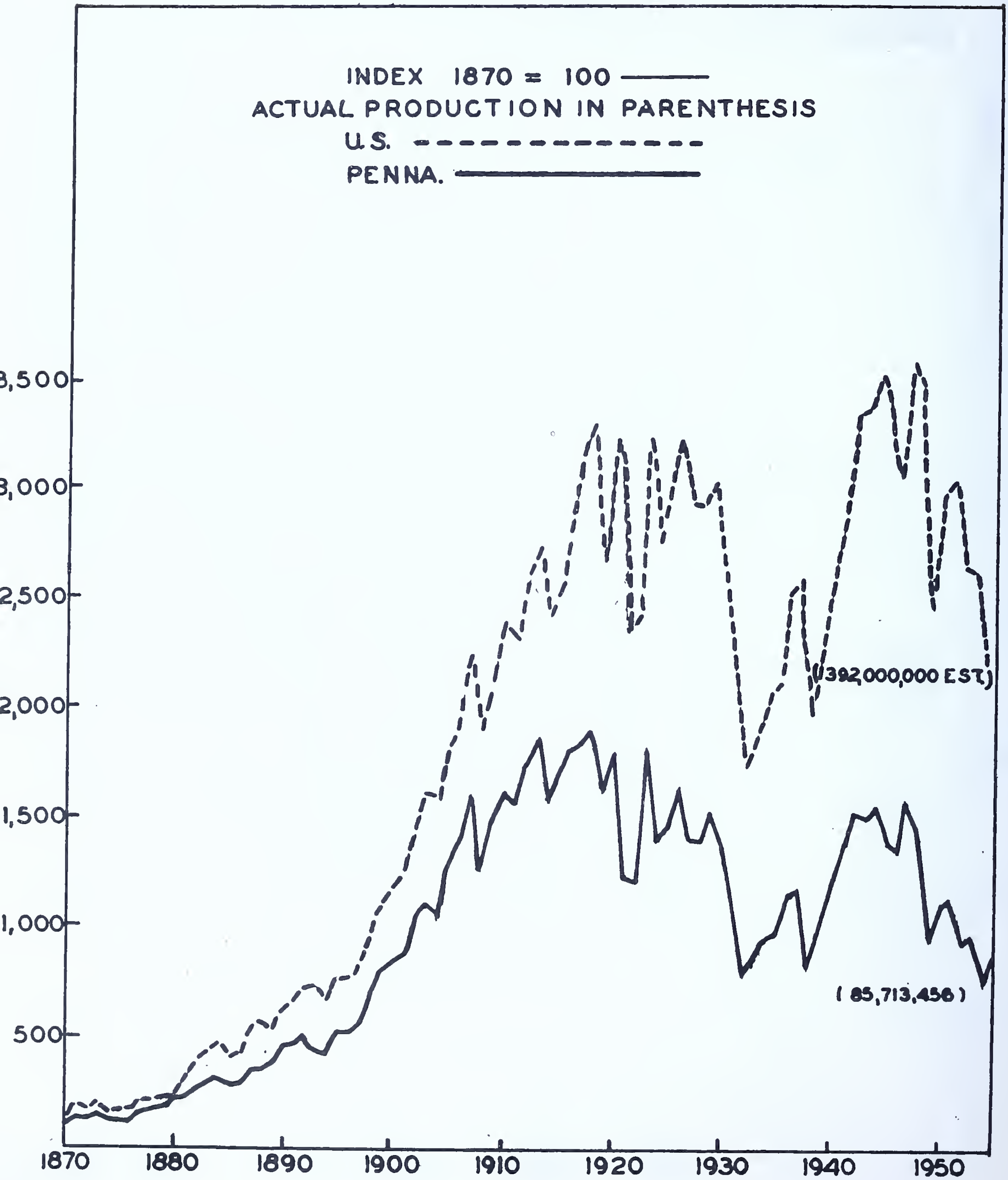
# EMPLOYMENT AND PRODUCTION OF CEMENT
# 1922 — 1955



STATE PLANNING BOARD
CHART VIII

a general transformation in the type of employment opportunities available to both men and women. A growing demand for technically trained industrial operatives and a declining demand for workers in repetitive tasks seems to be one inevitable outcome.

# BITUMINOUS COAL INDICES OF PRODUCTION



STATE PLANNING BOARD
CHART IX

## MINING AND QUARRYING - Charts IX, X, and XI

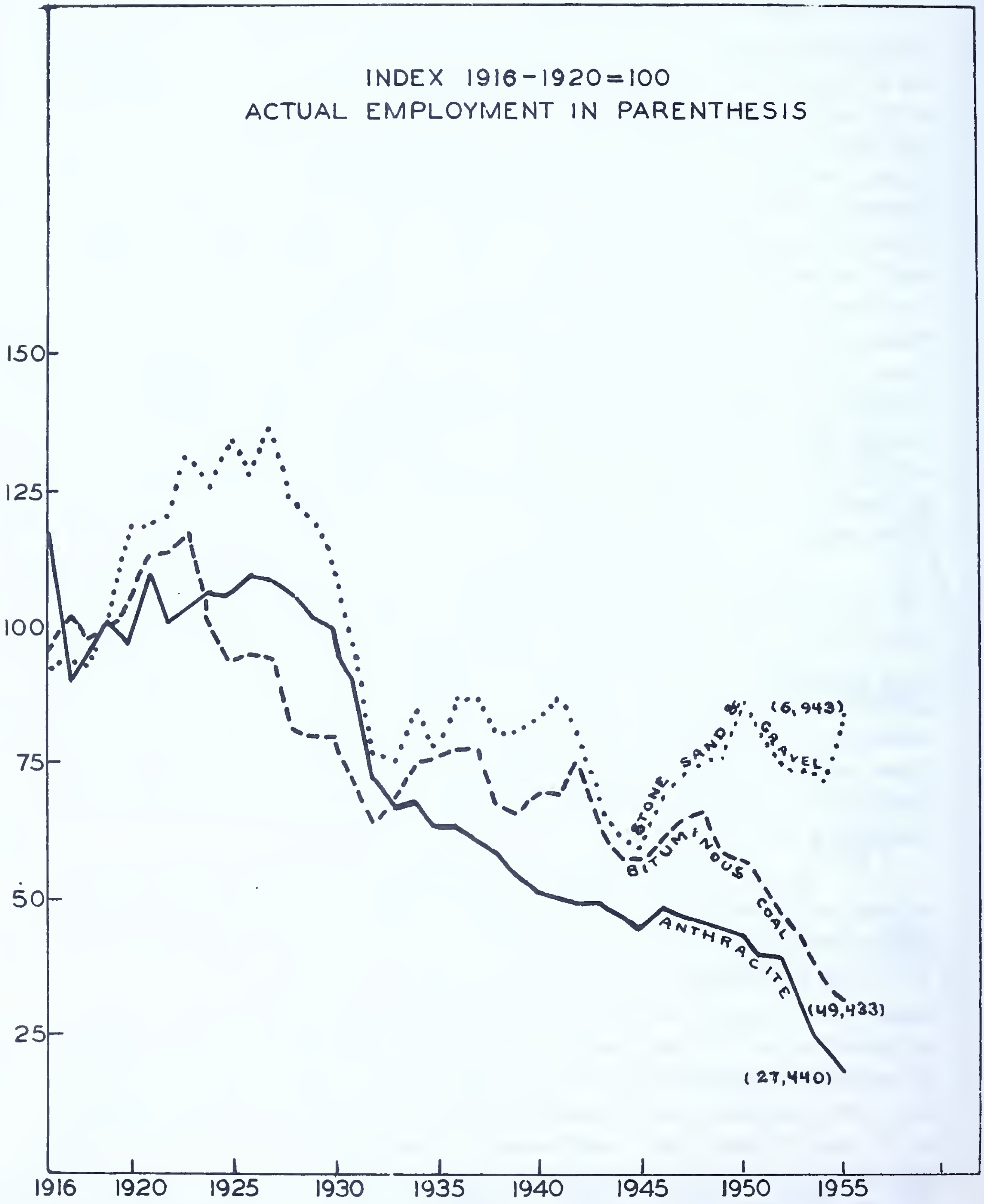
The Coal Mining Industry - One obvious cause of the decline in the ratio of Pennsylvania's industrial employment to that of our Nation is a rise in the importance of liquid and gaseous fuels in competition with coal. Despite an unparalleled record of continuous production by the State's great iron mine at Cornwall, coal has always been the principal product of Pennsylvania's mineral industries, but has of late years recorded serious losses in both production and employment. That fact is clearly shown by Chart IX in this report. In the Nation, mining employment has maintained an approximate level, despite certain cyclical ups and downs, since its recovery from the depression of the 1930's. In Pennsylvania's record, mining employment has exhibited a strong downward trend since the depression years. A reference to Chart X recording the principal components of this curve shows that while both bituminous coal and anthracite have participated in the downward employment trend, anthracite, after 1932, has led in the losses and is disastrously lower at the end of the period than at any time in the nearly 40 year record shown here.

How important this employment loss has been to the people of the mining communities of the anthracite areas of Pennsylvania is indicated quite clearly in Chart XI where the population growth rate of the five principal anthracite counties, Carbon, Lackawanna, Luzerne, Northumberland and Schuylkill is plotted on the same scale as the percentage changes in the average production of anthracite over five-year intervals from 1853 to 1953. The parallelism of the two lines is unmistakable despite the rise which occurred in anthracite output during the years of the Second World War.

One other measure of the decline in the relative importance of mining in the economy of the Commonwealth is the proportion of the State's mining employment to its total industrial employment. That proportion fell from 23.47% in 1916 to 5.35% in 1955.

It is not possible in this summary of Pennsylvania's industry to point out all of the factors which have led to this serious decline in employment opportunities in the State's coal mines. Even if demands for both anthracite and bituminous coal had continued at former levels up to the present year, employment in the State's mines would have declined due to improved methods of extraction, increased use of machinery and the mounting percentage of Pennsylvania's coal recovered in open

# MINE AND QUARRY
# INDICES OF EMPLOYMENT



STATE PLANNING BOARD
CHART X

pits by the use of mechanical shovels and drag lines. Production per man-day in stripping operations is often many times that possible in deep mines so that even at a steady level of demand a decline in the number of workers would have reflected these changes in the methods of operation.

Neither demand nor production have, however, remained at the level of the years 1916-1920, which are used as the base for most of the data in this publication. For various reasons, the State's competitive position in both the hard and soft coal industries has deteriorated during the past two decades.

Pennsylvania's bituminous coal reserves, while very extensive, are on the average now in deeper workings or narrower seams than those of West Virginia and Kentucky. Ours are the oldest coal operations in the Nation. They have produced to date more than 7,760,000,000 net tons of coal.

Cost of production is consequently higher than for most West Virginia and Kentucky coal. The Pennsylvania mines are closest to the industrial northeast with its large fuel-burning electric generating stations, but the freight differential in their favor does not appear to be adequate to compensate for the higher production costs except for coal produced in the strip pits. Because of a gradual loss of the railroad market to petroleum, the utilities have now become the principal consumers of bituminous coal, but there is considerable evidence that West Virginia can and does deliver coal to eastern utilities at a lower price than that of comparable coal from Pennsylvania. Ton-mile rates from the Pennsylvania fields are very considerably higher than from competing fields in other states. The increasing demand for coal in electric generation and for bituminous coke for the steel mills, with a growing chemical market for all the various by-products of the coke oven does not unhappily guarantee further growth for employment in Pennsylvania's bituminous mines. The chart of Pennsylvania's soft coal production as compared with that of other competing fields shows quite clearly that the State's bituminous producers have not been able to maintain their competitive position.*

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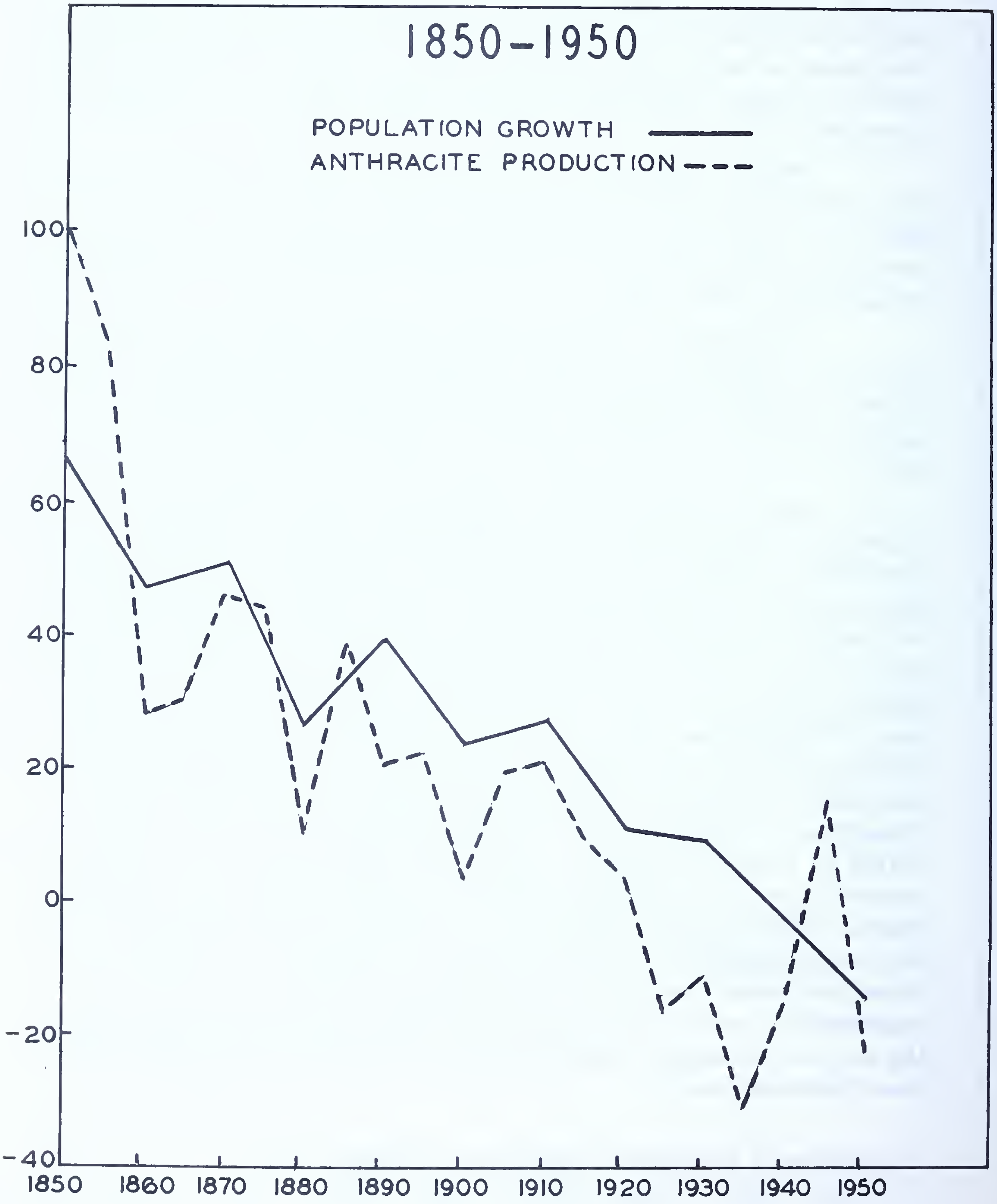
* "Pennsylvania Anthracite", Pennsylvania Planning, 1952.

# FIVE ANTHRACITE COUNTIES POPULATION GROWTH RATES AND PERCENTAGE CHANGES IN PRODUCTION



STATE PLANNING BOARD
CHART XI

Pennsylvania's anthracite has fared even worse in its competition with other fuels. Our State's hard coal, despite its advantages as a smokeless fuel, has in recent years encountered growing competition of oil and gas for domestic heating. Sales of all steam sizes are now below those for any previous period during the past generation. Anthracite stoker sales, which were mounting steadily through 1941, fell off sharply during the war because of lack of raw materials for stoker manufacture, and have not since reached the level of the 1938-1942 period. J. D. Jillson, Vice President of the Anthracite Institute, in a recent letter estimates that the number of anthracite stokers now in operation is around 75,000, as compared with 140,000 at the war-time peak. Few subdivision builders are now installing anthracite equipment. Without a period of extensive fuel oil shortage, the near-term hope for a substantial comeback for hard coal as a domestic fuel appears dim.

As a result of these conditions, employment both in the hard and soft coal fields of the State has drastically declined: in anthracite, from nearly 164,000 workers in 1925 to not much more than 27,440 in 1955; in the Clearfield-Piedmont bituminous field the loss has been 66.5%; and in the Westmoreland field approximately 66.6% since 1925. In part, these losses are shared with the United States as a whole, where coal employment dropped from 588,000 in 1925 to 250,000 in 1954, off 57.5%, but the fact is that Pennsylvania's coal mining employment and total production have both fallen off more rapidly than the employment and output of most of its competing states. As compared with 1925, Pennsylvania's tonnage in 1954 was 52.4%, little more than half, West Virginia's was 94.8%. The anthracite area produced only 42.5% as much hard coal as it had in 1925; Westmoreland, in the bituminous area, only 49% and Clearfield-Piedmont, 58.4%. These are heavy losses and the impact is particularly severe on certain Pennsylvania counties which once depended almost exclusively on coal output for their wealth and employment.

Such drastic declines and the resulting changes in industrial pattern, like any large scale changes in the economy of an area, must be dealt with on many fronts. There is obviously no single cure-all for the dilemma of the State's coal mining counties.

Two distinct types of problem are evident - that of the coal industry and that of the coal counties themselves. Their time scale is different.

Because of its strategic location, Pennsylvania coal is a price-less national heritage of fuel energy and chemical raw materials. A recent estimate fixes the total recoverable bituminous reserves of the Commonwealth at 14,750,959,000 tons. Other estimates have been higher. There is also a reserve of anthracite adequate to heat the Nation's eastern cities for almost another century. These reserves should not be lost, but can largely be lost, particularly in the anthracite field, if operations in mines are discontinued and water flooding makes later re-opening too dangerous to be practicable.

Some of the factors influencing the trend toward gas and oil are beyond control within the mining industry or within the State. If it were possible to secure reduced rail rates for anthracite to principal consuming points in the Middle Atlantic and New England States and Canada, some advantage would be gained. If a solution can be found to the very serious water flooding which occurs in most of the anthracite mines and which frequently involves the necessity for pumping 20 or more tons of water from the workings for every ton of coal extracted, a further reduction in cost might be obtained. Mine drainage projects now receiving State and Federal aid may eventually lower production costs in some areas, but this help comes very late.

Improvement in various types of equipment using the smaller and cheaper sizes of hard coal have also come somewhat late to reverse the present trend toward gaseous or liquid fuel and it does not appear likely that the industry could be supported at present extraction costs from the sale of its product at prices now obtaining for the smaller anthracite sizes.*

Atomic energy may or may not prove to be the safe and inexhaustible source of power that it now promises to be. But we do know, though still imperfectly, the worth of our coal measures.

Inquiries into the chemical structure of the coal molecule, the associated deposits of various elements such as germanium in the coal seams, and into the technology of the synthesis of coal-based products are obvious undertakings for the research agencies of our State. The long-term importance of such research is very great. Certain directions of investigation which have been prominent in the past are receiving renewed attention from the industry, such as the use of anthracite in foundry cupolas to replace metallurgical coke and the use of anthracite in the sintering of iron ore. The growing scarcity of high grade coking coal due to a long-continued heavy demand is bringing the use of anthracite as a substitute into the realm of possibility. Experiments have been conducted in this field by the Hudson Coal Company since 1939. Sintering operations have been carried out on a pilot-plant basis by Bethlehem Steel at Lebanon, for concentrating the Cornwall magnetite and there appears to be no question that the process is practicable, physically and chemically. The decisive question, of course, is whether the use of Pennsylvania anthracite in either of these industrial processes is now economically feasible. This is also the question of first importance in regard to the use of anthracite in the output of producer gas.

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* "Pennsylvania Anthracite", Pennsylvania Planning, 1952.

If any of these uses could be justified financially, the resulting demand might be measured in millions of tons. Both Pennsylvania State University and the Mellon Institute have been concerned in investigations in these fields and have reported on their findings during the Annual Anthracite Conferences of Lehigh University as early as 1940. If anthracite can be justified as a practicable partial replacement for coke and if the use of anthracite as a blend in coke production could also be shown to be economically advantageous, the resulting demand might reverse the anthracite industry's declining trend, which on other grounds seems, temporarily at least, to have leveled off toward the close of 1955.

The Coal Mining Counties - Output per man-day and man-hour in both surface and underground mines has increased from 4.50 in 1935 and 5.78 in 1945 to 8.2 tons in 1953. In the strip pits the increase was from 12.01 tons in 1935 and 15.46 in 1945 to 17.6 tons in 1953. These increases have barely begun to show the effect on mining practice of such new equipment as the Continuous Miner, an expensive device which can in many cases produce coal faster than it can be carried away, or the so called "Auger Miner" which can bore deep into an exposed coal face after open-pit mining becomes impracticable. It is estimated by the Federal Reserve Bank of Cleveland that operations with the continuous miner should average more than 20 tons per man-day. At present less than 7% of all coal is extracted by these machines. Other labor saving improvements in handling are being forced on the industry by competitive conditions. As in so many other directions, technological progress is demanding fewer but more technically skilled operatives for each unit of product.

In the manufacturing industries increased productivity has been in part compensated for by increasing the variety of products and, of late years, by substituting a luxury standard for a utility standard of demand. In the production of the mineral fuels this type of compensation is much harder to effect. For this reason it seems probable that, however important it may be to the economy of the State to increase its output of anthracite and bituminous coal, it does not appear probable that any increase in production which seems likely in the future will solve the employment problems of our hard and soft coal counties.

Granted that one is willing to face this fact, adequate employment in the mining counties must depend on the stimulation of existing manufacturing and service industries or the development of new industries by the combined efforts of State and local agencies.

In this direction, encouraging progress has already been made.

A recent study of all the standard metropolitan areas in the United States, by the Scripps Foundation of Oxford, Ohio, shows that in only six areas had manufacturing employment between 1940 and 1950 increased more than 5%. One area each in Texas, California, Michigan and Kansas had gained that distinction; but there were two such areas in Pennsylvania. One was the metropolitan district of the City of Scranton and the other the metropolitan district of Wilkes-Barre--Hazleton. In other words, despite serious discouragements, and the continued presence of a large number of unemployed persons, the citizens of those two areas have courageously attacked the task of transforming their economy.

To assist in effecting such a transformation and to create a climate favorable to renewed growth and progress, community, county and regional planning commissions organized under the State enabling acts could do fully as much for the coal towns as such agencies have done to solve problems of other types of community throughout the State and Nation. The goal of community planning is that of directing the development of needed facilities and of overcoming historic and physical handicaps in order to provide a better environment for business and residence. Good community planning is an essential background for programs of industrial development.

As was stated in the beginning of this summary of the State's coal problems, no single direction of attack can provide for the area the new opportunities which are necessary to replace the temporary or permanent losses of employment once provided by coal mining. The directions of effort indicated here and suggested in earlier publications of the State Planning Board* involve intensive research to develop new uses for the chemical and physical properties of coal, new and more economical means of using both soft and hard coal in industrial processes and renewed efforts to secure transportation rates which will enable Pennsylvania coal to compete on even terms in the national fuel market. They involve programs of community improvement in the coal areas to overcome the physical and environmental handicaps resulting from many generations of mining. They involve intensive efforts to bring new industries into the area and parallel efforts to encourage the development of local enterprises, employing local labor and management, and financed by local capital, however small such beginnings may be. The history of Pennsylvania industry during the past century is ample warrant for a confidence that within the State, and within the mining communities themselves can be found the physical and human resources to create employment opportunities lost in coal mining.

Metal Mining and Quarrying - Pennsylvania was at one time an important producer of nickel, chromium and zinc and is still one of the Nation's two principal sources of cobalt, a metal of many uses in the arts and essential in the production of the powerful magnets used in radio and television receivers and in hundreds of new processes and devices. The once important zinc production of the State depended on the output of a single deep mine where serious water flooding finally ended the operations. This mine is now being reconditioned and Pennsylvania may soon become again a producer of primary zinc. Nickel and chromium are no longer produced in Pennsylvania. Its cobalt is a by-product of the operation of the famous Cornwall iron mine, which also yields annually both silver and gold.

Employment in the mining of iron ore, which averaged approximately 346 workers during the 1916-1920 period, declined to 220 in 1921, rose to 744 in 1927, fell drastically to a low of 84 in 1933, gradually rose to 671 in 1941 during the Second World War and recently attained its highest recorded number (768 in 1953 and 874 in 1954).

* * * * * * * * * * *

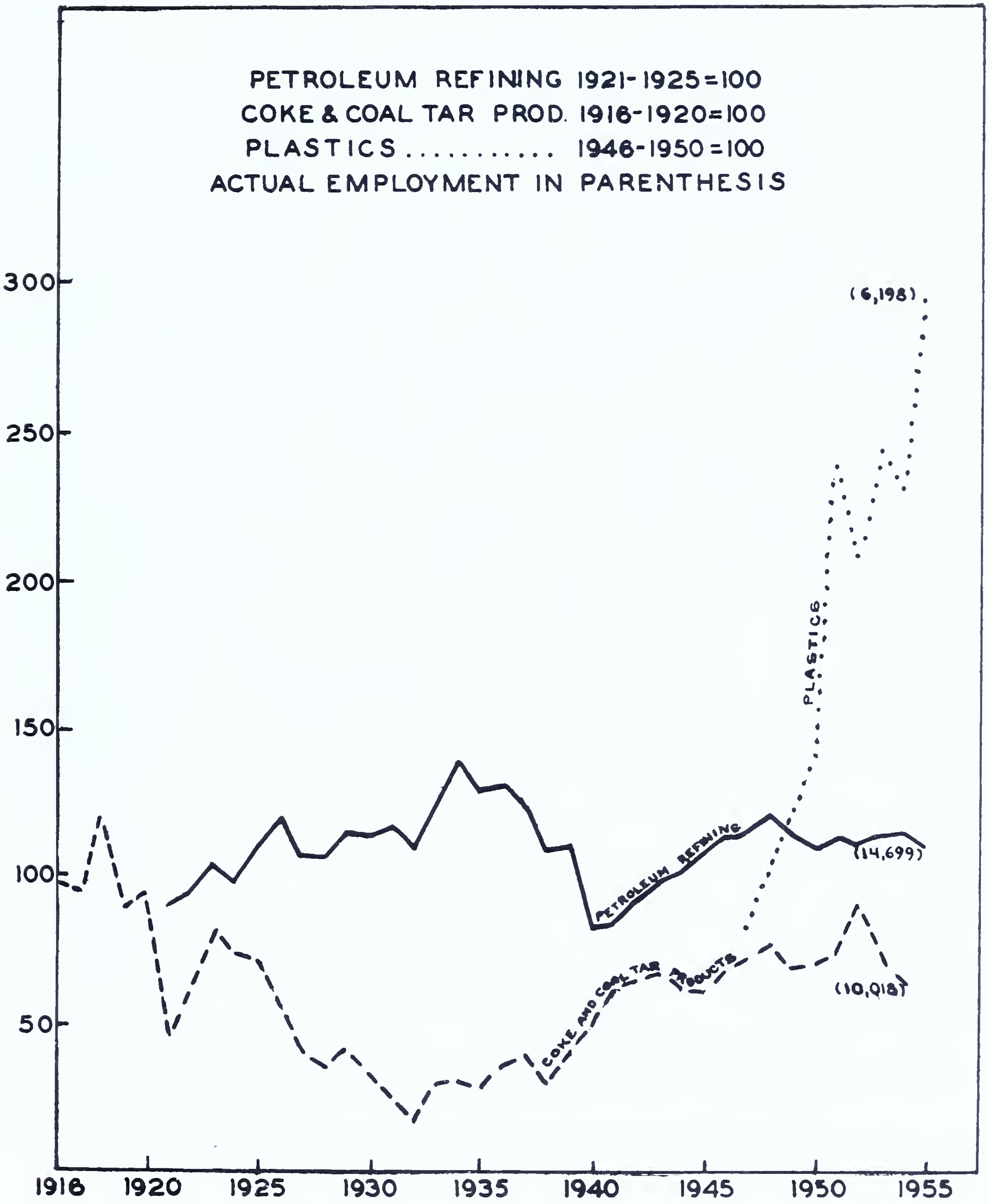
*"Pennsylvania Anthracite, 1952.

*"Pennsylvania Bituminous Coal, 1953.

Among the important branches of the State's quarrying industry are the dressing of building stone, the fine art of splitting out slate for the Nation's blackboards and the quarrying and preparation of the fine grades of sandstone on which the State's extensive glass manufacturers largely depend for their raw material. In recent years expanded slate, manufactured from the refuse of the slate quarries, has been widely used as a lightweight aggregate in concrete and as a thermal insulation. The production of crushed stone for highway construction is another busy branch of the industry.

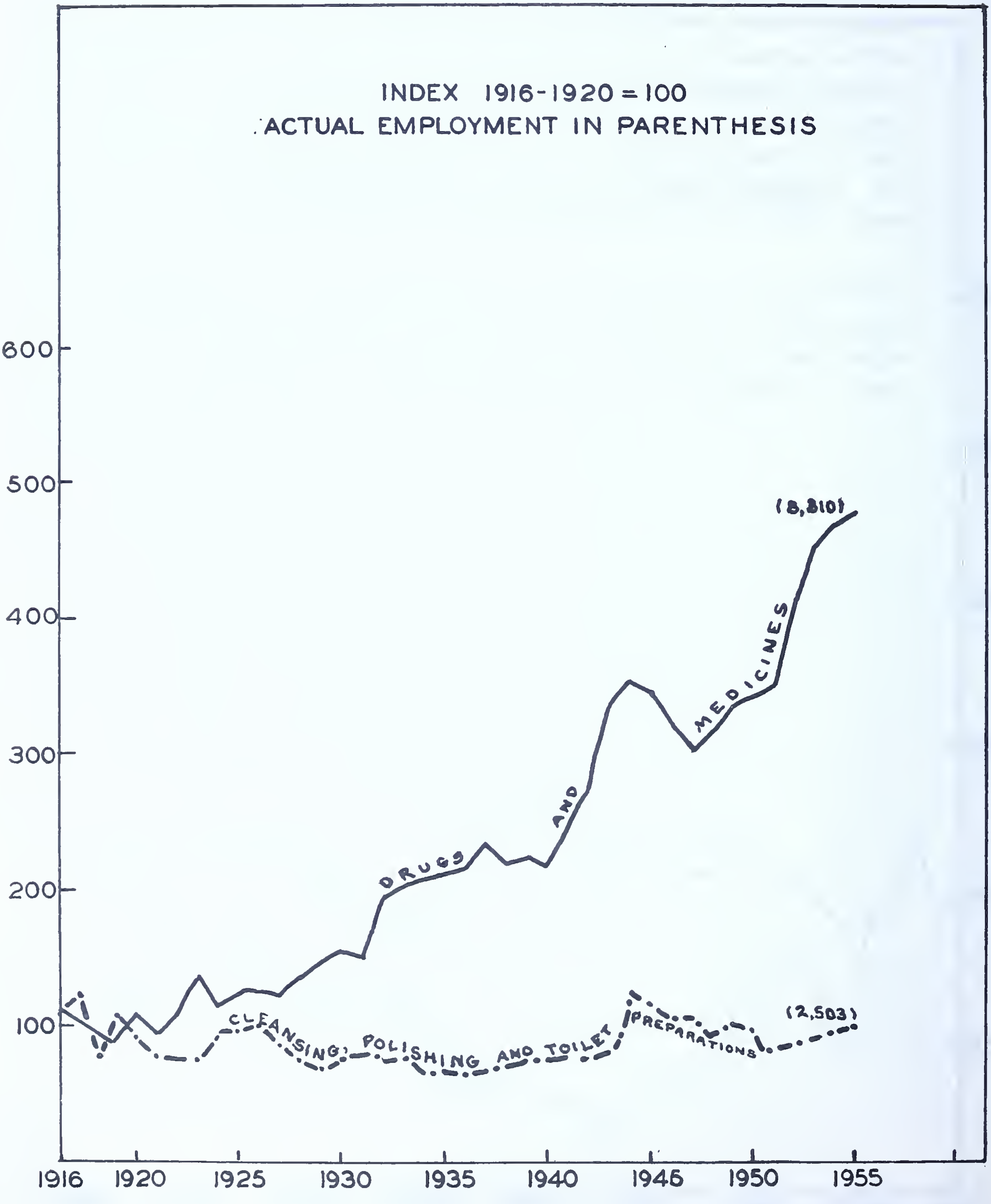
Important as the quarries of the State are in the national picture (Pennsylvania is the leading producer of slate in the United States, and is also first in the Nation in both total output and value of stone), these industries are not large sources of employment except in limited areas.

# CHEMICALS
## INDICES OF EMPLOYMENT



STATE PLANNING BOARD
CHART XII

# CHEMICALS
# INDICES OF EMPLOYMENT



STATE PLANNING BOARD
CHART XIII

## CHEMICALS AND ALLIED PRODUCTS - Charts XII, XIII, and XIV

Under this general classification are included the refining of petroleum and for purposes of comparison the production of coke and coal tar products* as well as chemicals, explosives, alcohol, acids and wood distillates which are grouped under the subhead Chemicals and a large number of derivatives including cleansing and polishing preparations, printers ink, matches, paints, varnishes, patent medicines, soaps and toilet articles, all of which are usually classified as Chemical Products. On the first of the accompanying charts, one sees the contrast between the long established industries, particularly petroleum refining, or the production of coke and coal tar products and a relatively new enterprise, the manufacture of plastics and plastic materials, which has sprung into prominence during the past 15 years.

Petroleum refining is an industry which illustrates in so far as its labor requirements are concerned, the conflicting trends of technological improvement, requiring fewer and fewer workers for a given product, and a very large expansion in the industry itself. These two forces after 1946 have stabilized the State's employment record in this very important field. Coke and the manufacture of coal tar products since 1932 (a year in which Pennsylvania's petroleum refining showed very little loss in employment but the coke industry was deeply depressed) have considerably increased their labor force due to the expanding demand for coke by the steel mills and the rising market for the chemical materials available from coal tar.

The long down trend of employment in the coke industry from 1918 to 1932 shows the effect of the replacement of the beehive coke ovens by modern by-product ovens, which are much more economical of manpower. In 1916, the beehive ovens employed more than 14,000 workers. This branch of the industry then suffered a drastic decline so that by 1932 it employed only 716 men. Heavy demand in the past 20 years has revived many of the beehive operations and by 1952, 2,616 were working in that segment of the industry although in 1955 employment had dropped again to 709 persons. Employment in by-product coke production suffered a considerable decline in the depression years, but since that time

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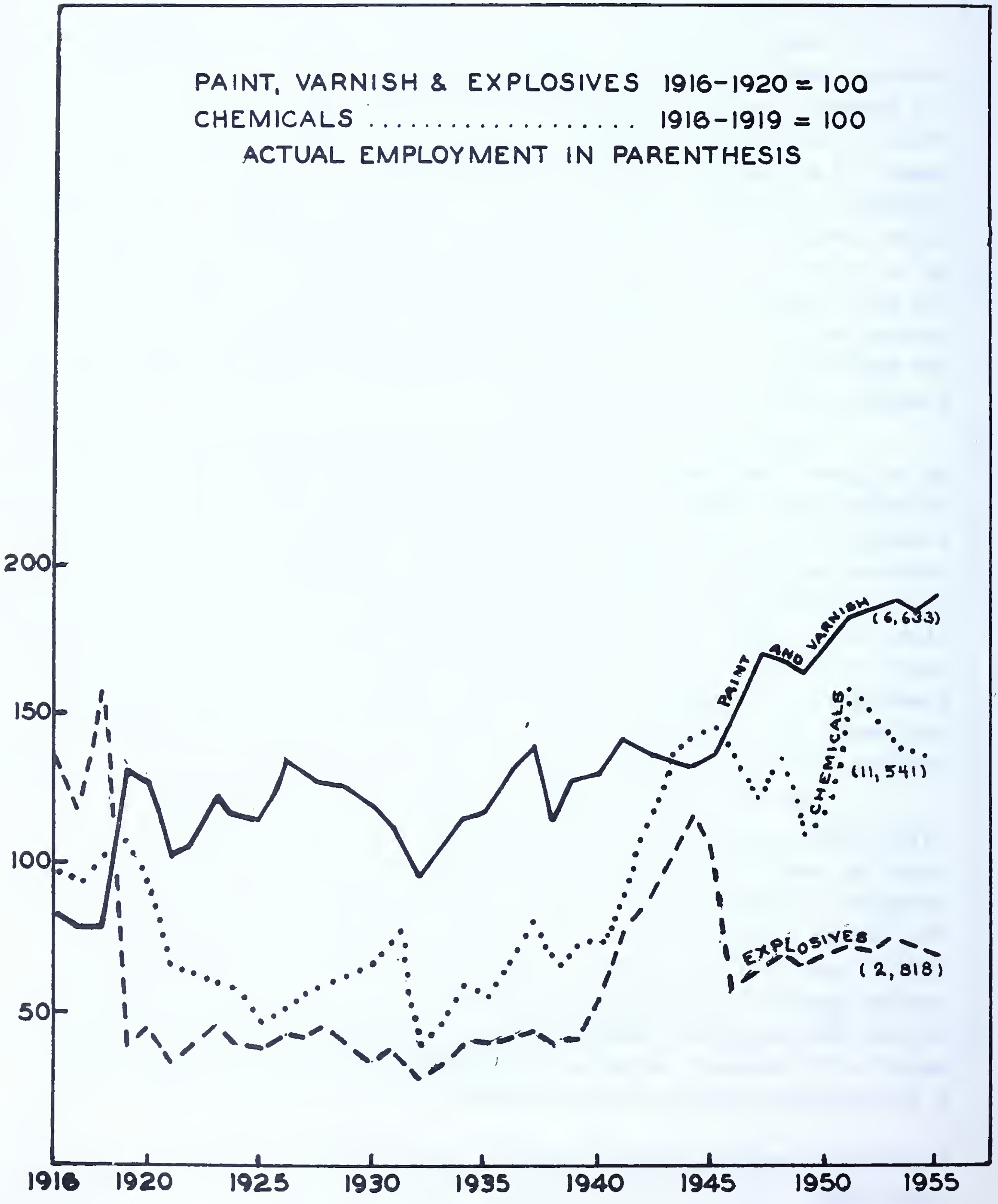
*Included in Miscellaneous Products in Internal Affairs Classification 1916-1954.

# CHEMICALS
# INDICES OF EMPLOYMENT



gradually rose to 5,603 in 1955. Dye stuffs from coal tar provide work for some 500 or 600 men, and coal tar production for 2,800 or 2,900 so that the total employment in this important branch of the chemical field rose from a low point of 2,900 workers in 1932 to 13,675 in 1952 and declined to 10,018 in 1955.

How greatly efficiency in manufacture has increased productivity in the chemicals industries is shown by the fact that in 1918, during the First World War, approximately 52,000 workers in the industry were responsible for an output valued at $542,000,000. By 1955, 63,224 workers were credited with a product valued at $2,376,836,400. Despite the high level of prices in 1955 as compared with the period of the First World War, this rise of 339% in value of product represents substantial progress. However, in view of the remarkable expansion of the chemical industry in our Nation, and the immense variety of new products derived from organic and inorganic materials, the fact that employment in that industry represented 3.3% of the total Pennsylvania industrial working force in 1918 and had risen only to 3.8% in 1955 seems to indicate an undue conservatism in the State's industrial pattern in recent years. In 1954 there were only eleven counties in the State in which our chemical plants and oil refineries employed more than 1,000 people, while fifteen counties registered no employment whatever in this field.

In the manufacture of drugs and medicines, though the Census of 1947 showed us leading in biologicals, we were only fifth in employment and fourth in the value of product for the industry as a whole. We were eighth in employment in the manufacture of soaps and glycerine, sixth in employment in the manufacture of paint and pigments and seventh in value of product in that field, third in employment and third in value of shipments in the large field of miscellaneous chemicals, tenth in employment in cosmetic and toilet preparations, sixth in employment in the large group of organic chemicals not otherwise classified by the Census and second in employment in the production of plastic materials.

It is true that the classification "Chemicals" in our data source fails to include the State's important Viscose and Acetate manufactures whose production is classified under textiles and that there are fields in the chemical industry in which Pennsylvania occupies a dominant position, but it is obvious that great opportunities still exist for expanding the production of industrial and consumers' goods from the raw materials which now flow in such abundance from our great petroleum refineries and by-product coke ovens.

It has long been known that anthracite producer gas may be used for the synthesis of ammonia and methanol. Natural gas and the coke oven gases and by-products are potential sources for dye stuffs, photographic and industrial chemicals, organic drugs, synthetic rubber and thousands of materials which may play a large part in shaping the pattern of a new age.

Pennsylvania leads our Nation in the output of coal tar, the richest known source of many of those products which loom so large in the prospects of our industrial future. With an output of nearly 229,260,000 gallons of coke oven tar in 1954, of 231,206,075,000 cubic feet of coke oven and blast furnace gas in that same year, 501,994,556 pounds of coke oven ammonia, and 72,682,464 gallons of crude light oil, the foundation is here for as great a leadership in the organic chemicals industry as that once enjoyed by the German Reich.

It seems apparent that the further establishment of chemical and plastics industries close to the sources of taw materials in our Commonwealth offers one of the State's best opportunities for industrial development.*

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*See also Appendix I to this report in which are discussed the prospects for extracting liquid fuels economically from bituminous coal and anthracite.

## CLAY, GLASS AND STONE PRODUCTS - Charts VIII and XV

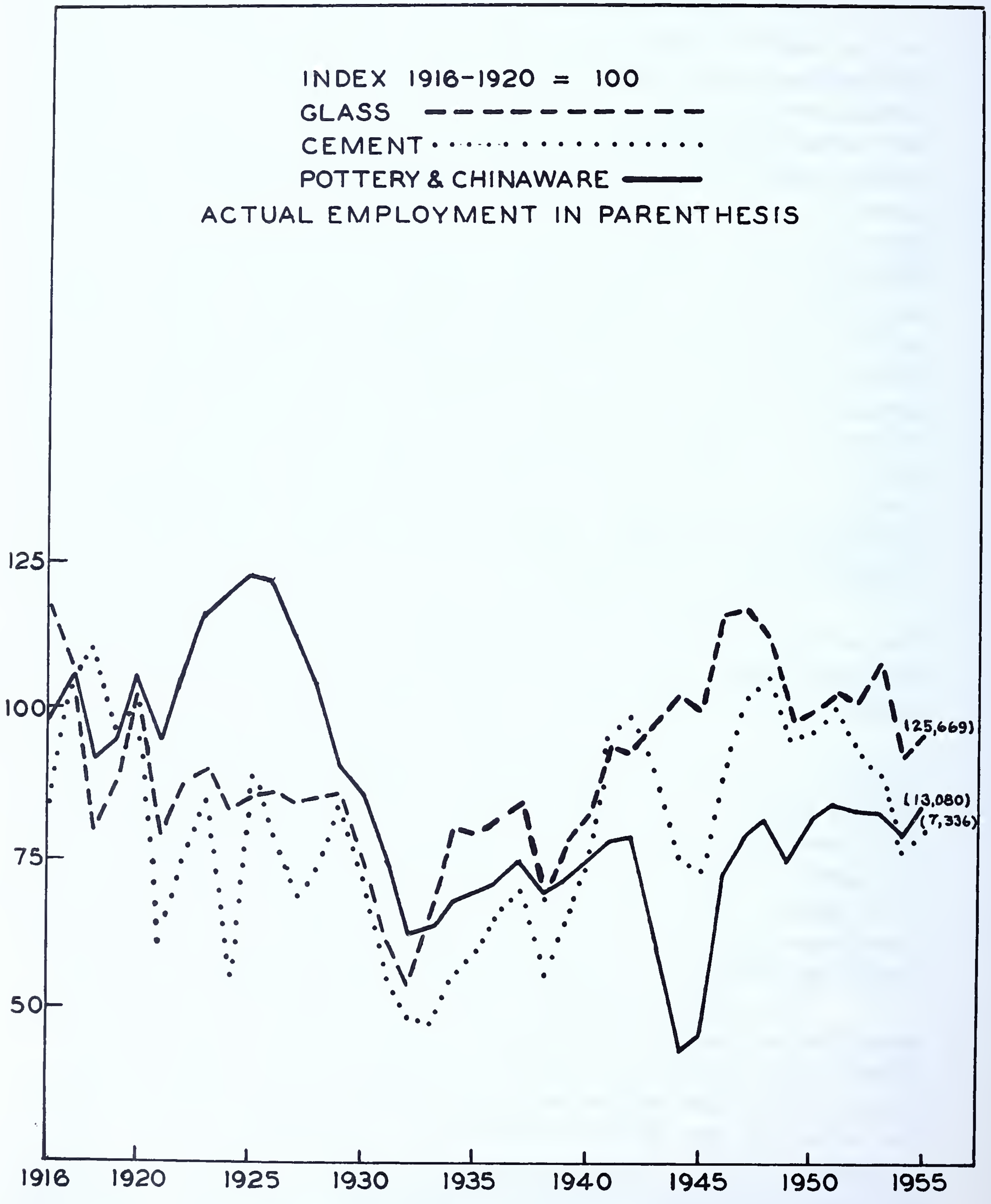
In this borderline classification, which touches on the field of quarrying on one hand and manufacturing on the other, the principal products are: fire brick, including refractory brick such as those used for lining steel furnaces, paving and building brick, portland, or hydraulic cement, in which Pennsylvania's output leads the Nation; concrete products, such as pipe, block, and burial vaults, crucibles made of refractory clay or graphite, emery and abrasive materials, pottery and chinaware, terra cotta, porcelain insulators, statuary cast from concrete or plaster of Paris, prepared lime and gypsum. The glass industry, based largely on an abundance of glass sand available in many of Pennsylvania's counties, but particularly in the northern and eastern sections of the State, includes the manufacture of bottles and jars, cut, engraved and stained glass products, tableware, and also plate and window glass and glass for the windshields of automobiles. Many of these products are processed or manufactured close to the source of the basic raw material, or in locations with abundant supplies of natural gas, the preferred fuel in many branches of this industry.

The anomalous nature of the clay, glass and stone classification is emphasized by the difficulty of locating fiber glass, an important Pennsylvania product, in the traditional industrial scheme. It has in the past been classified as a textile product.

Fiber glass is an altogether new material of widely expanding utility in hundreds of applications, ranging from unbreakable hammer handles and resilient fishing rods to shimmering pearly fabrics and heavy insulating blankets. It is classified as a textile, but the product has outgrown formal description. Spun in minute electric furnaces from clear glass balls the microscopically fine threads of glass are woven into decorative and fire-resistant cloth, or fused into astonishingly strong and elastic rods, replacing steel, wood or bamboo for many uses.

The overall employment in the various manufacturing and semi-manufacturing industries forming the clay, glass and stone industrial classification has not strikingly changed during the past 40 years, despite the serious decline which occurred during the years of the great depression. In 1916, 68,279 workers were listed as employed in 901 establishments. In 1955, 64,064 were employed in 802 establishments. A great difference is evident, however, in the level of wages and salaries, which amounted to $50,000,000 in 1916 and to $263,000,000 in 1955, and

# CLAY, GLASS AND STONE INDICES OF EMPLOYMENT



STATE PLANNING BOARD
CHART XV

in the rise in the value of products from $135,000,000 to $807,000,000. At the lowest level in 1932, only 627 firms were active, employment was 35,349, wages and salaries totaled $29,529,000 and the value of products was $80,970,000.

With few exceptions, the various components of this industrial group, different as they are in type of product, have risen and fallen along somewhat parallel lines during the four decades shown here, since most of them are dependent to an unusual degree upon construction activity, or the heavy industries; and except for glass containers and tableware, are not largely represented on the list of consumers' goods.

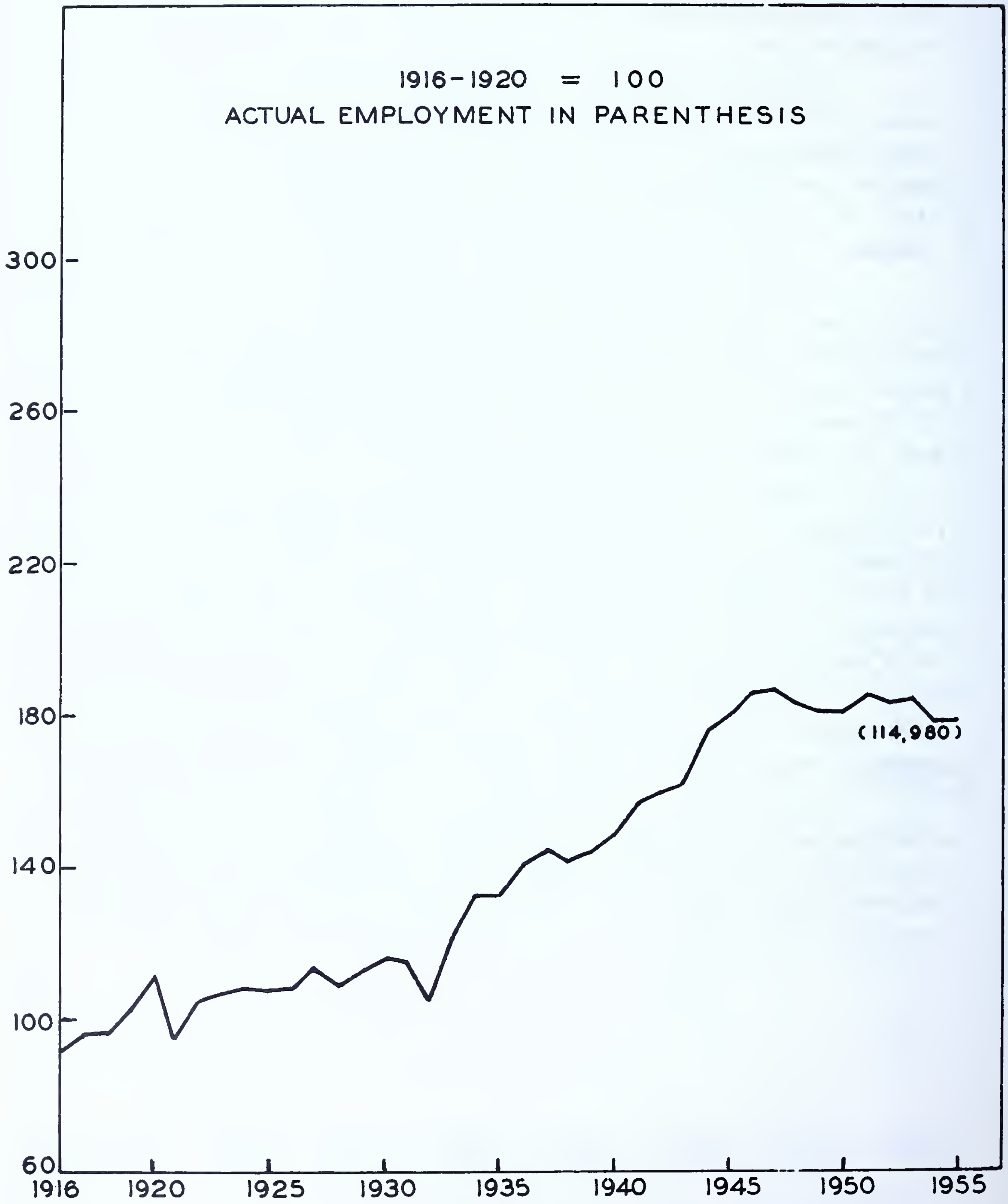
The American cement industry, which began in Pennsylvania, has of late years become far more fully mechanized than was true in the past and operates much larger kilns, so that despite the large volume of our State's production, 44,489,014 barrels in 1954, employment in 1954, (7,277 workers) is well below the 9,624 engaged in the industry in 1920, when the production was 28,294,000 barrels.

Glass, too, is an industry which has experienced a technical revolution,. particularly the making of flat glass, but while the output of that product has continued to show gains, and the State has continued to hold its position as a leader in the industry, employment in 1954, 26,610, does not reflect the great increase in production since it is below the 31,483 engaged in the industry in 1916.

The manufacture of pottery and chinaware, in some branches of which Pennsylvania is also a national leader, has been an industry where methods of manufacture have kept pace with demand.

Since 1938, employment which had suffered severely in the great depression has shown a very gradual rise, but has stabilized at a level very close to that attained nearly forty years ago. The total in 1955 was 13,080 which may be compared with 13,898 in 1943, 13,318 in 1923 and 13,177 in 1916.

# FOOD AND KINDRED PRODUCTS
# INDEX OF EMPLOYMENT



STATE PLANNING BOARD
CHART XVI

## FOOD AND FOOD PREPARATION - Charts XVI, XVII, and XVIII

Food preparation is traditionally the most stable of all industrial groups, but in Pennsylvania, during the past generation, several of the components of this general industrial class have shown remarkable growth, while others have remained relatively unchanged in their employment record. Food products are the fourth most important source of industrial employment in the Commonwealth, being preceded only by metals, mining and textiles. They accounted in 1955 for more than 6.99% of all manufacturing employment, the total of that year being 114,980.

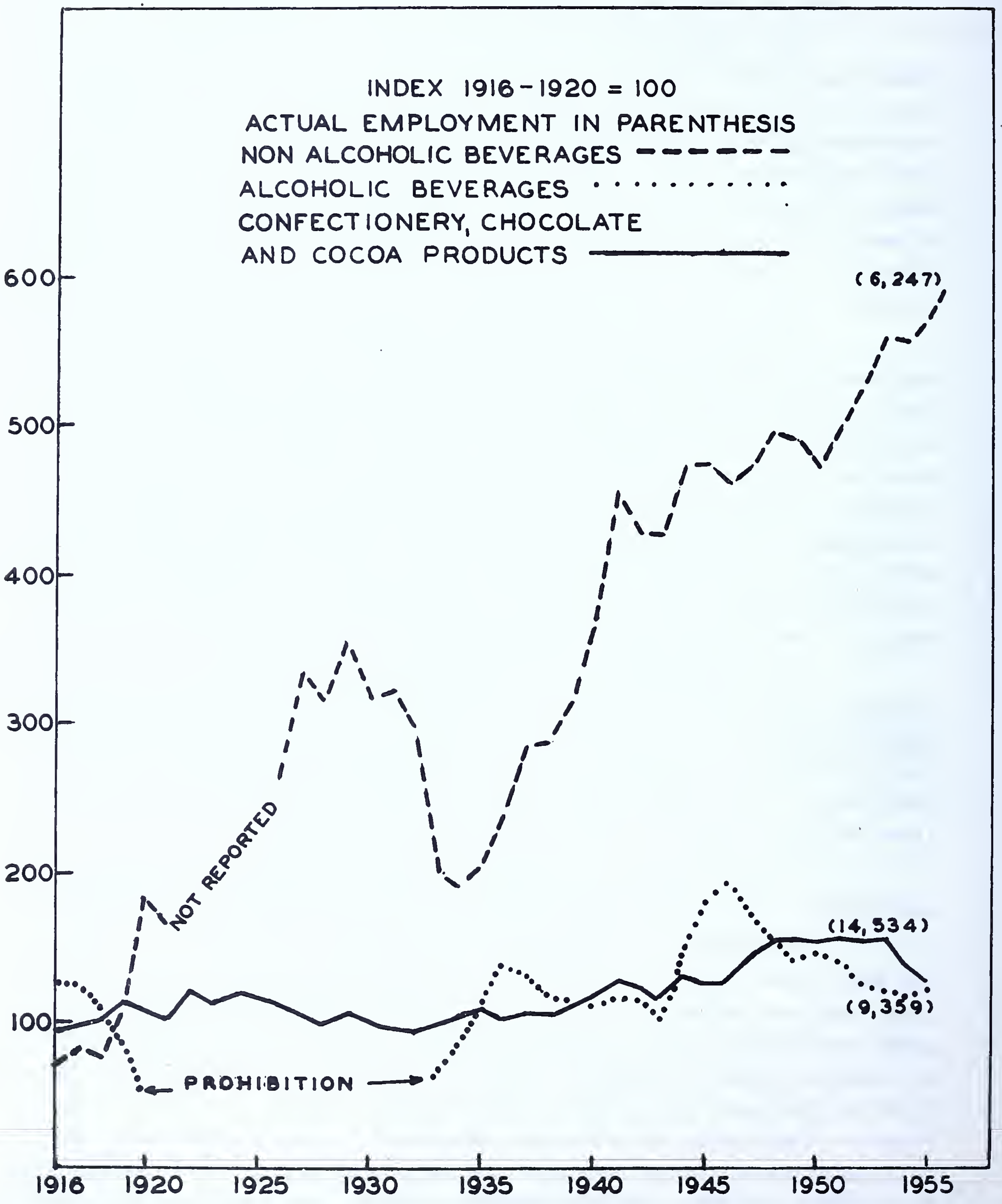
During years of low business activity, the percentage of employment provided by the food industry is relatively higher than in years of great prosperity. Thus in 1929, only 4.8% of industrial employment was in the food industry, but in 1932, at the depth of the depression, the percentage had risen to 7.02%. In 1938 and 1939, in the recession following the high production of 1937, the food industry's percentage of the State's total rose again past 7%. Again, during the hectic years of the Second World War, only 5.7% of all employment was in the foods industry, but in 1955 this percentage rose again possibly because of an increased use of packaged food.

Total employment in food processing since 1946 has, however, changed very little (120,000 in 1946 and 1947; 118,000 in 1948; and 115,000 in 1955.) As with the textile industry, it is to food preparation that the State must generally look for employment stability in years of depression. On the other hand, neither of these industries is so stimulated by high economic activity as is the metals group.

Of recent years, the demand for dairy products and consequent employment in that type of food preparation has been comparatively stable.

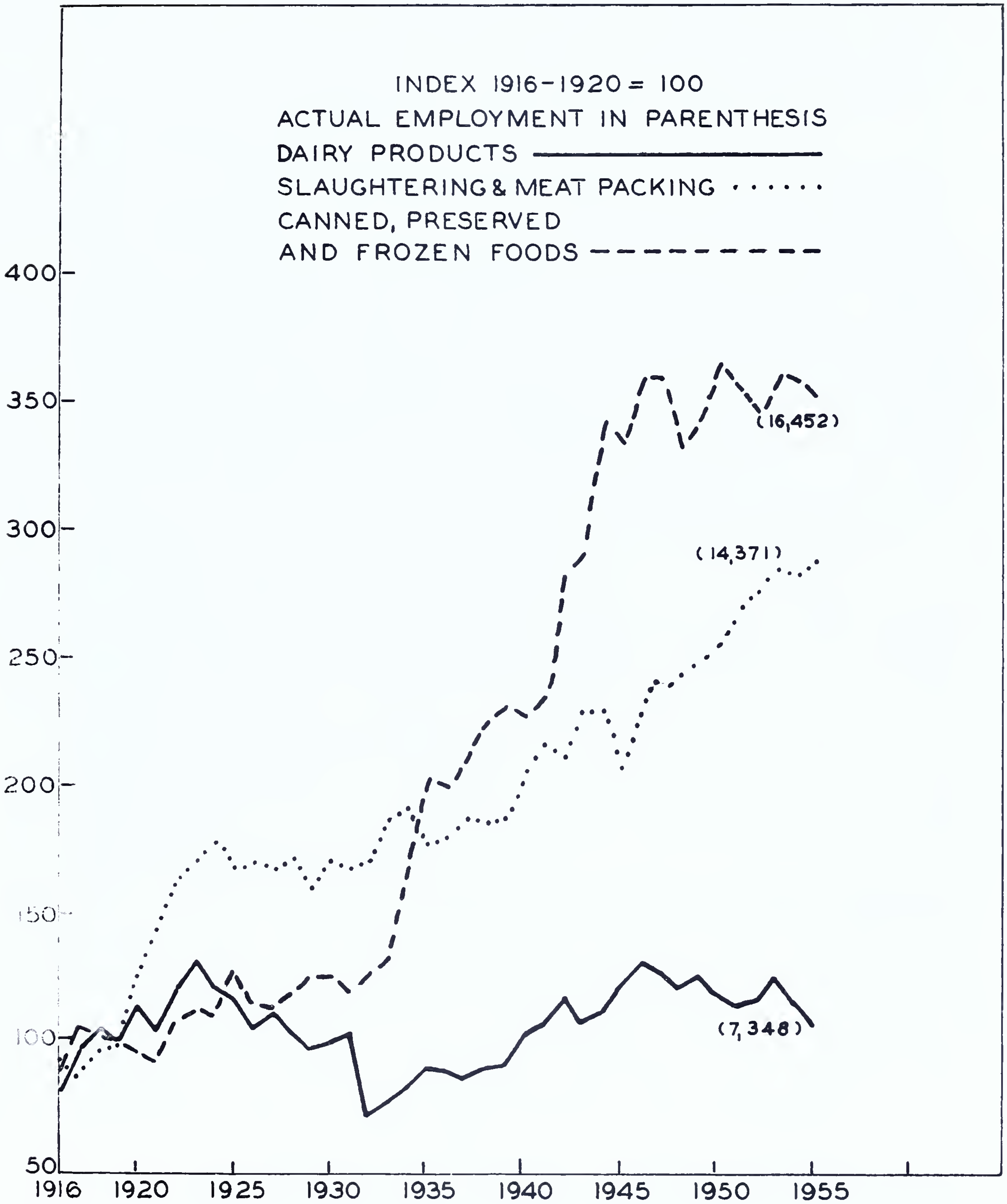
Employment in confectionary and chocolate production, in which the State leads our Nation, has maintained a higher sustained level since 1948 than ever before in the history of the Commonwealth. Outstanding gains were made in the preparation of canned, preserved and frozen foods, an industry which now employs nearly 15,500 workers as compared with 4,900 in 1930 and 9,500 in 1940. Another growing industry, but one of less relative importance in providing employment, is the preparation and bottling of non-alcoholic beverages and carbonated waters, which employed 6,247 workers in 1955, as compared with 3,986 in 1940. Employment in the preparation of alcoholic beverages has declined in recent years, the

# FOOD AND KINDRED PRODUCTS INDICES OF EMPLOYMENT



STATE PLANNING BOARD
CHART XVII

# FOOD AND KINDRED PRODUCTS
# INDICES OF EMPLOYMENT



STATE PLANNING BOARD
CHART XVIII

high point having been reached in 1946 with 14,977 workers. The 1955 total was only 9,359. Slaughtering and meat packing have grown progressively through the years and have shown a steady increase since 1916, with very slight dips in depression years.

There is no evidence on the chart of employment in the food industry that Pennsylvania has as yet fully developed its opportunities in various forms of food processing made possible by the State's basic agriculture. In each of 18 counties from 250 to 1,000 persons are employed in preparing food for the market, but in each of 23 Pennsylvania counties, several of which are distinguished by their agricultural production, less than 250 people are employed in that industry. Since this is a type of production well adapted to decentralization it appears that full utilization of the opportunities afforded in the preparation or packaging of agricultural products could insure the continuous growth of the State's food industry for years to come. The evidence on our chart that the upward progress in employment gains has been halted makes this a matter deserving careful consideration.

Some of the Nation's largest tin plate mills are located in the Commonwealth. So also are leading manufactures of glass containers. Pennsylvania is among the important producers of fruit and grain crops, including buckwheat. The canning or packaging of these products and the preparation of feed for the large dairy herds and poultry flocks of the Commonwealth, might well provide whole or part-time employment for a growing number of workers in all of our agricultural counties. There is every evidence that the dependence on prepared and packaged foods in the average American home is steadily growing. With their close access to many of the largest consumer markets in the world, Pennsylvania farms and country towns afford ideal locations for various types of food packing industries based on local agriculture.

## LEATHER AND RUBBER - Chart XIX

These rather casually associated types of manufacturing form one of the major industrial classifications reported on by the Pennsylvania Department of Internal Affairs, the principal source of the data used in this report.

In 1955, 49,042 workers were employed in these two industries, as compared with 36,843 in 1940, 30,097 in 1930 and 36,724 in 1923.

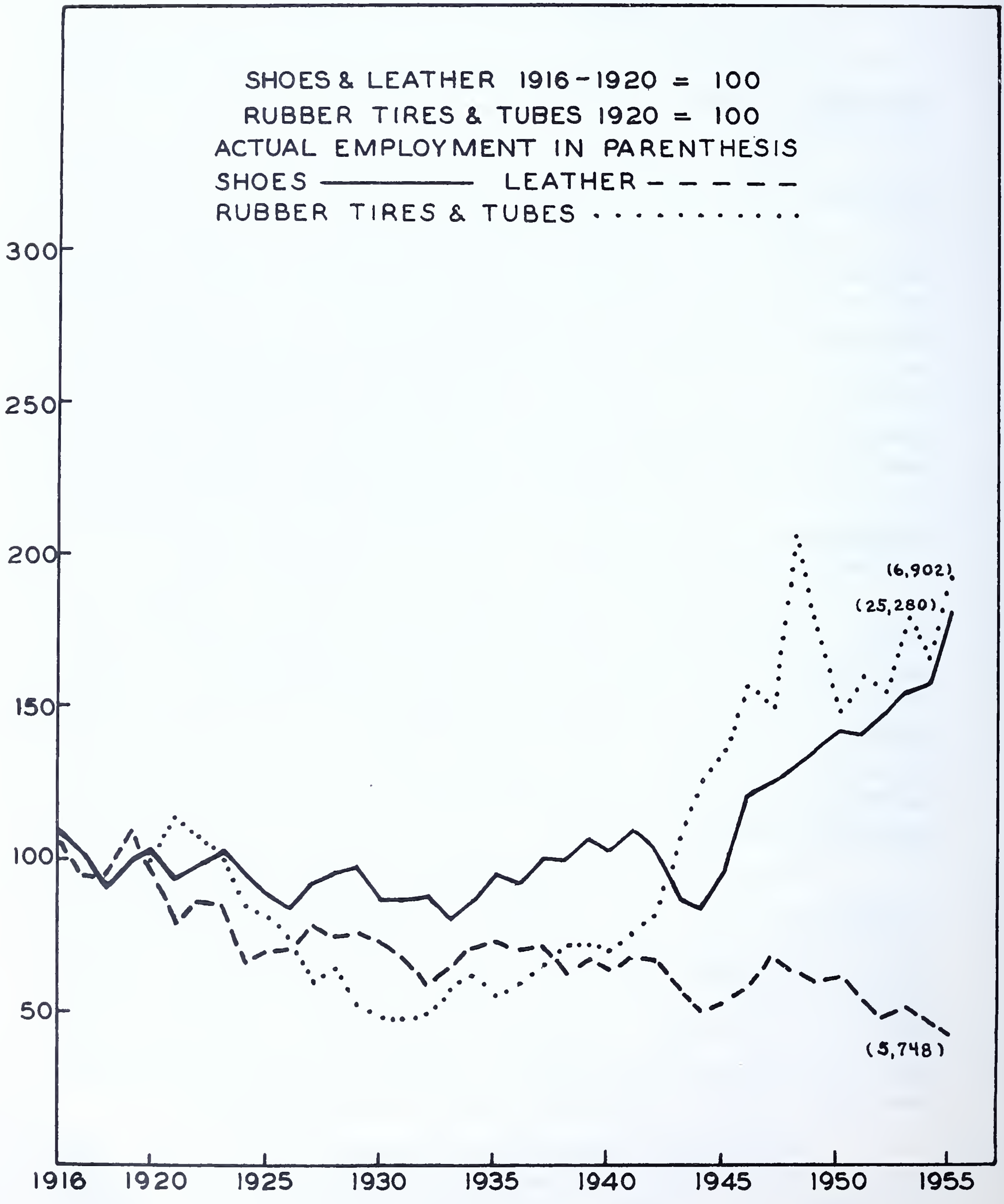
Employment in the preparation of leather, in which Pennsylvania, because of its once tremendous stand of hemlock trees and the widespread use of hemlock bark for tanning, led the Nation for so many years, has dropped during the past generation from 11,237 in 1923 to 5,748 in 1955. This drop occurred despite the fact that the Pennsylvania leather industry was a pioneer in the transformation from bark tanning to chemical tanning when the decline in the supply of native hemlock bark made this change necessary in the first quarter of the century. Of recent years sole leather has been meeting the competition of various plastic and synthetic rubber compounds, particularly in the manufacture of children's and sport shoes.

The index of employment in the shoe industry shows that this branch of manufacture is relatively depression-proof. In 1933, when so many industries were still in a state of extreme prostration, employment in shoe manufacture had dropped only 20% below the 1916-1920 level. After that minimum year, the rise was steady until the index stood at 102 in 1937, decreased slightly during the Second World War from causes already noted, but rose rapidly from 1946 on, and in 1955 stood at 183, the 1916-1920 average being 100.

With a well-developed tradition of the leather crafts in Pennsylvania, and a steady increase of population in the Commonwealth and the Nation, shoe manufacture should provide a further and dependable growth in employment. During the past generation, the number of pairs produced annually per wage earner rose from 1,658 to 2,830. While the output per worker rose, the number of employes also increased by 47%, which indicates that the industry is adapted to Pennsylvania working conditions, and has a very hopeful future in the Commonwealth.

Although the manufacture of rubber tires and inner tubes provides only a fraction of the employment required by the shoe industry, its recent rise has been very encouraging percentagewise. By 1931,

# LEATHER AND RUBBER
# INDICES OF EMPLOYMENT

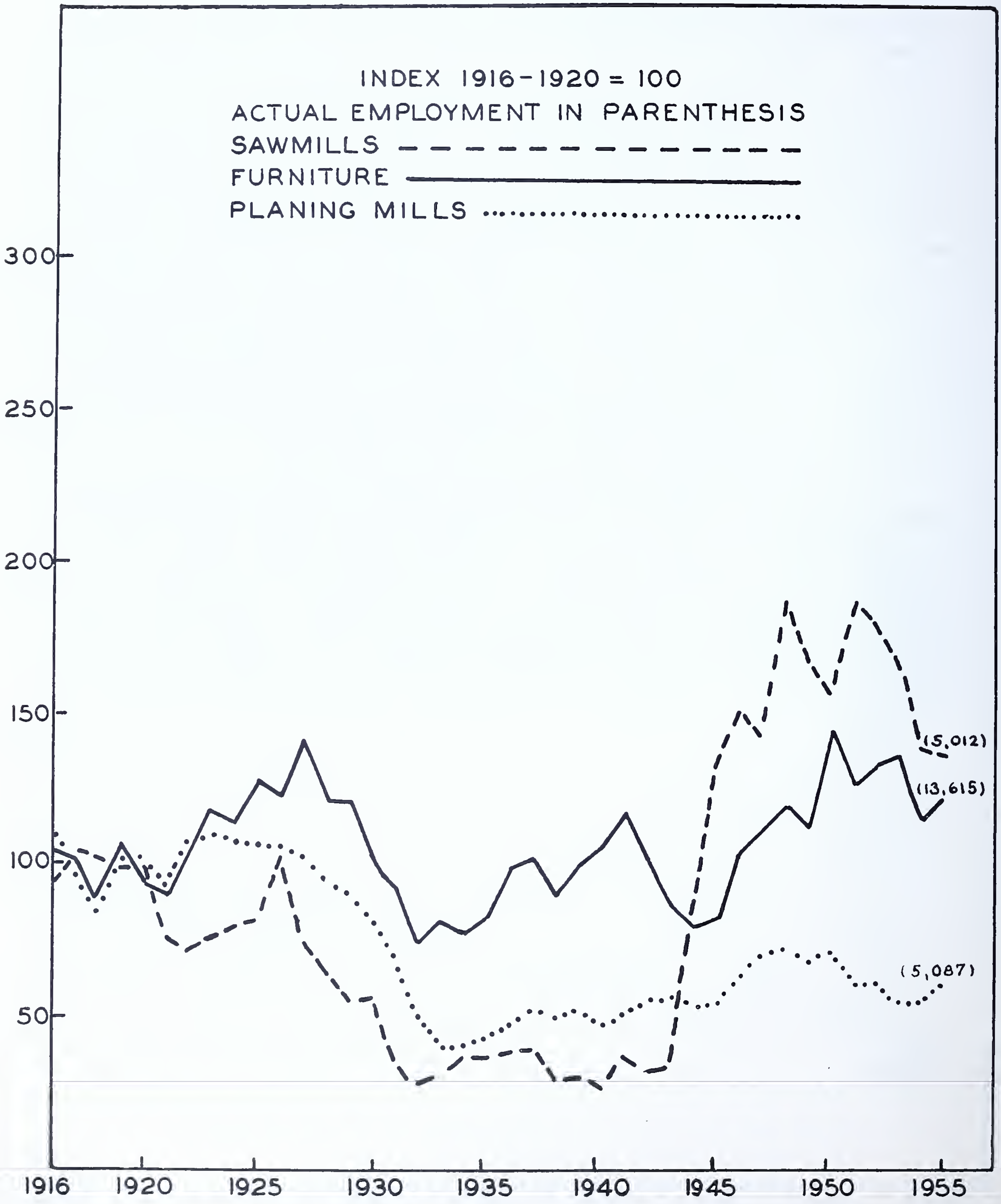


STATE PLANNING BOARD
CHART XIX

employment in the tire industry had fallen to less than 50% of its 1916-1920 average, but even during the depression years the industry began somewhat irregularly to engage more workers. A peak of employment was reached in 1948 when automobile and the tire manufactures were recovering from the scarcity of materials for civilian use which had prevailed during the war. Improved methods of operation have greatly increased productivity per worker, and despite the fact that tires and tubes are now larger, heavier and in every way better constructed than ever in the past, the volume of Pennsylvania's output rose from four million units in 1920 to nearly twenty million in 1954, which included approximately ten million tubes and more than nine and one-half million tires. Here again is an industry in which the State, with its advantageous marketing position in the populous east, tends to lag far behind Ohio, but appears to be gaining sufficient advantage from its location to promise further expansion in an extremely important field of manufacture.

Miscellaneous rubber manufactures employed approximately 7,000 in 1955, as compared with 2,000 in 1920. These miscellaneous products include hose, rolls for mangles, floor mats, shoe heels, printers' rolls, belting and the like which, like sole leather, are meeting new competition from various types of plastic. Though Erie and Philadelphia Counties are most important in this field, firms located in 23 other counties throughout the State participate in this industry.

# LUMBER AND WOOD PRODUCTS INDICES OF EMPLOYMENT



STATE PLANNING BOARD
CHART XX

## LUMBER AND WOOD PRODUCTS - Chart XX

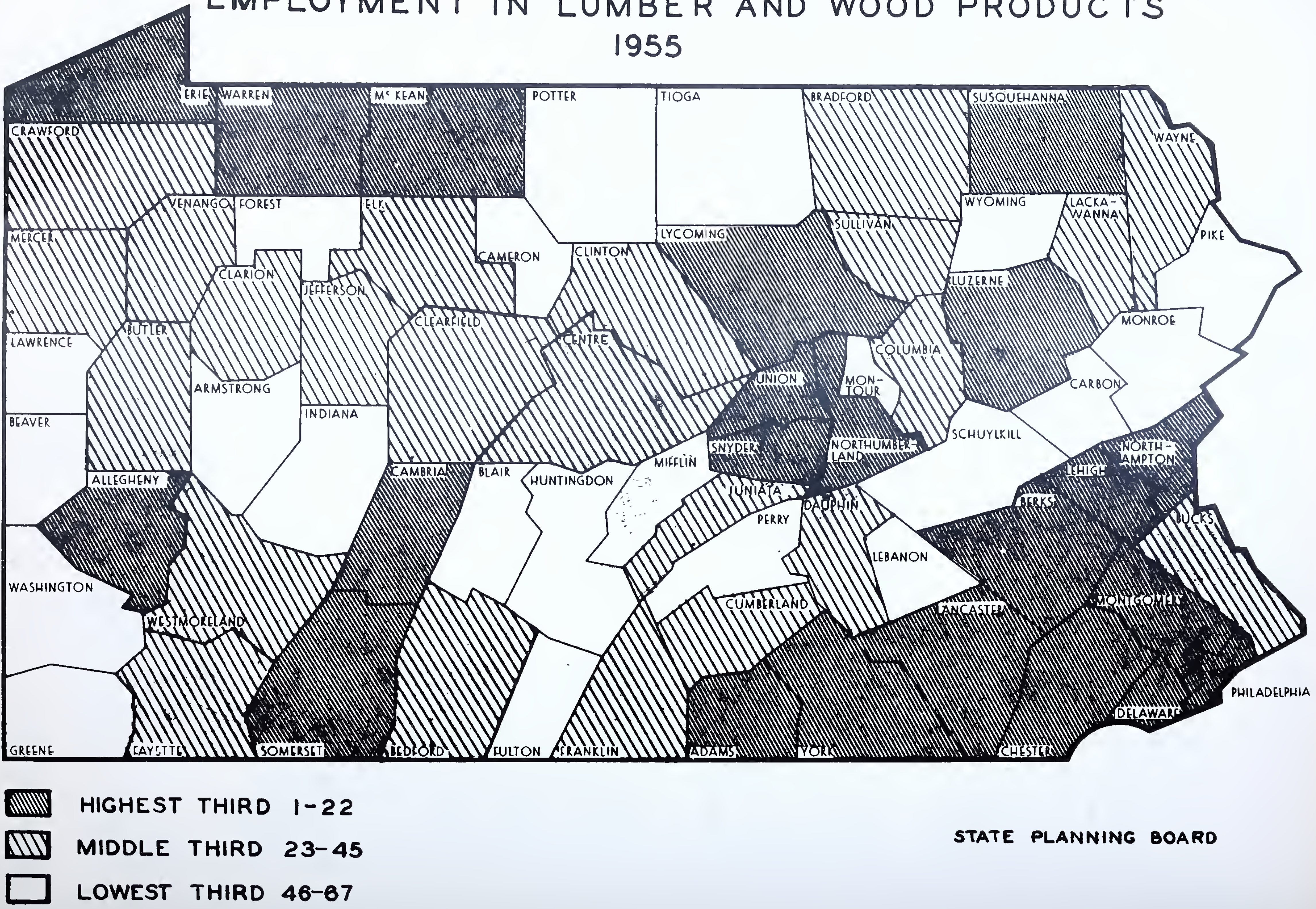
Employment in the production of wood and wood products, including furniture, was relatively high in the 1916-1920 period which is used as the basis for our index series. The average of that five-year period was approximately 35,000 workers. By 1932, employment in the industry had declined to 20,107, but from that extreme depression year gradually recovered until in 1948 it was close to the record high of 37,864 in 1916. It stood at 34,717 in 1955, a year of great general prosperity.

During the period of our record the low point of wages and salaries in the woodworking industry was 1933, when the total was $17,261,800 as compared with $46,319,000 in 1920. The value of the production of the industry reached a low point one year earlier, in 1932, with a total of $43,667,800 which may be compared with $171,719,700 in 1920. Recovery from that low year has been steady and somewhat spectacular. Compensation of workers was $92,630,000 in 1955 and the value of production, $297,511,500.

One of the most satisfactory aspects of this recovery has been that a measurable part of the employment gain has been in the production of lumber from Pennsylvania's own forest lands. In September 1944, the State Planning Board's summary of the lumber and timber branches of the wood industry noted that the State's employment in that field "had shown a marked decline, and a failure to make a healthy recovery since 1932. That this is due", the report continued, "to the depletion of the State's timber resources seems clearly evident from the fact that the decline continued steadily through the rising consumers' goods market in the late 20's, and that it was resumed again in the period following 1937, after a brief recovery from the depression low." To confound this pessimistic survey, in the very year that report was issued a rapid increase of activity in the State's saw mills resulted in a very considerable rise in employment in the primary lumber industries. Such rapid changes in trend should inspire a certain modesty in all economic forecasts.

The actual number of employes in the State's saw mills, which was 3,645 in 1920, reached its low point at 1,039 in 1932, showed relatively little change until 1943, and in 1944 suddenly increased to 3,522. By 1948 it had risen to 6,821 and then declined to a figure of 6,044 in 1953 and to 5,012 in 1955.

# EMPLOYMENT IN LUMBER AND WOOD PRODUCTS
## 1955



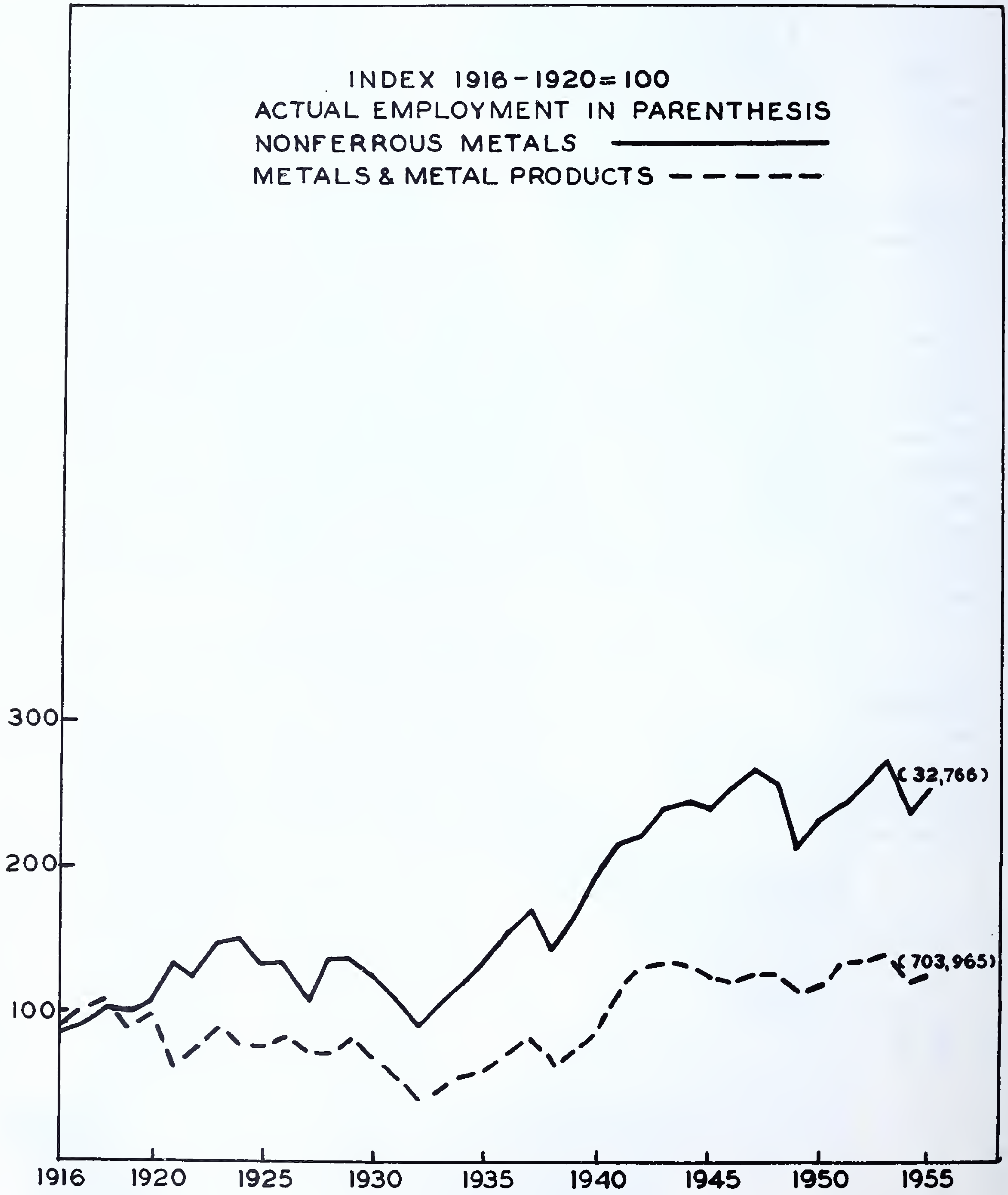
STATE PLANNING BOARD

In the manufacture of furniture a gradual increase occurred from 10,540 employes in 1920 to more than 15,000 in 1927. At the depression low, employment had fallen to 8,350, but rose again to 12,900 in 1941, dropped off to 8,853 in 1944 as a result of the war, then reached a high point of 16,000 in 1950, declined to 14,000 in 1951 and to 13,615 in 1955.

Employment in planing mills has not shown much recovery since the depression years, a fact which is, in part, the consequence of the widespread use of western lumber in construction, and the fact that much of that lumber is shipped east in a finished condition. The relatively large number of establishments engaged in woodworking or allied industries, approximately 10% of the State's total industrial plants, emphasizes the fact that many branches of woodworking are traditionally operated by small shops, employing a few craftsmen engaged in the manufacture of a product which can be produced at its best only by skilled handwork. Furniture making and cabinet work thus offer to the craftsman an opportunity for independence, and the satisfaction of artistic production, with a relatively small capital outlay. On the other hand, some branches of the industry are highly mechanized, and are adapted to modern mass production.

The gradual recovery of Pennsylvania's native forests, and the realization of the importance of scientific cutting rather than the wholesale slashing or clear cutting that often took place in the past may, in the long run, stimulate further growth in many types of industry supported by Pennsylvania's own timber crop. Relatively few counties in Pennsylvania fail to offer employment of one type or another in the wood products field.

# METALS AND METAL PRODUCTS
# INDICES OF EMPLOYMENT



STATE PLANNING BOARD
CHART XXI

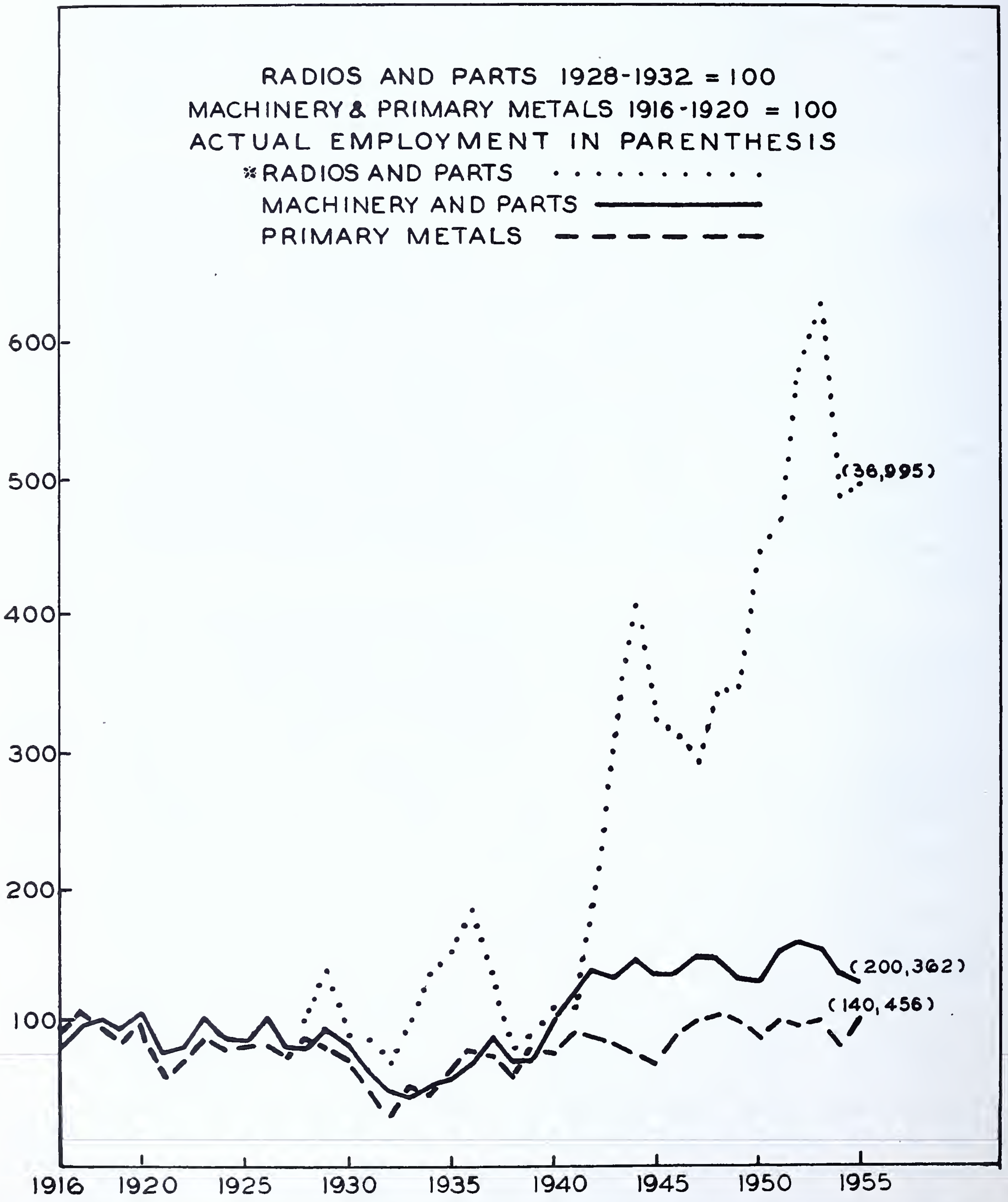
## METALS AND METAL PRODUCTS - Charts XXI and XXII

The metals and metal products industries are more important as a source of employment in Pennsylvania than any other single industrial group but, as shown by the accompanying chart, employment in this vital line of manufacture had apparently reached a stabilization level in 1942, - a level which it did not break through upwards until 1953.

In 1916, 35.7% of all Pennsylvania's industrial workers were engaged in the production of metal or metal products. By 1955, employes in this group of manufacture made up 42.84% of the State's total. The State's heavy concentration of employment in the metals has, in the past, given rise to serious problems, since this type of manufacture has been subject to very wide fluctuations. During years of war, demand for metal products is unusually heavy. In years of economic depression, no other type of industry is so seriously hurt. From a high point of 602,000 employes in 1918, the number of Pennsylvania workers in the industry declined to 245,000 in 1932, rose again to 756,000 in 1943 during the Second World War, dropped to 635,000 in 1949 and reached its highest recorded point at 786,987 in 1953. It declined again to 703,965 in 1955.

Undoubtedly, the rise of employment in the non-ferrous metals during the Second World War and, more recently, in radio and similar young industries, which are classified as part of the metals group, added to the 1953 total. On the other hand, technological advances in the manufacture of machinery and in the production of the primary metals have slowed the increase of employment in the industry as a whole, despite immense growth in capacity and volume of output. In 1953, though the tonnage of basic iron and steel produced in the Commonwealth had more than doubled since 1920, the number of workers in that branch of the industry had showed no increase. Mechanization had reduced by 50% during one generation the man power needed to produce a ton of iron or a ton of steel. Here as in the mining industry and in many of the branches of the textiles we are presented with one of the fundamental problems of our civilization. America is today very rapidly devising and adopting many radically new methods of production. While the surplus of manpower thus released has so far been absorbed into other industries, particularly the service industries and distribution, it is by no means sure that this process can be indefinitely continued. When demand for labor in certain highly specialized fields such as coal mining rapidly declined in recent

# METALS AND METAL PRODUCTS
# INDICES OF EMPLOYMENT



*1928 FIRST YEAR REPORTED

STATE PLANNING BOARD
CHART XXII

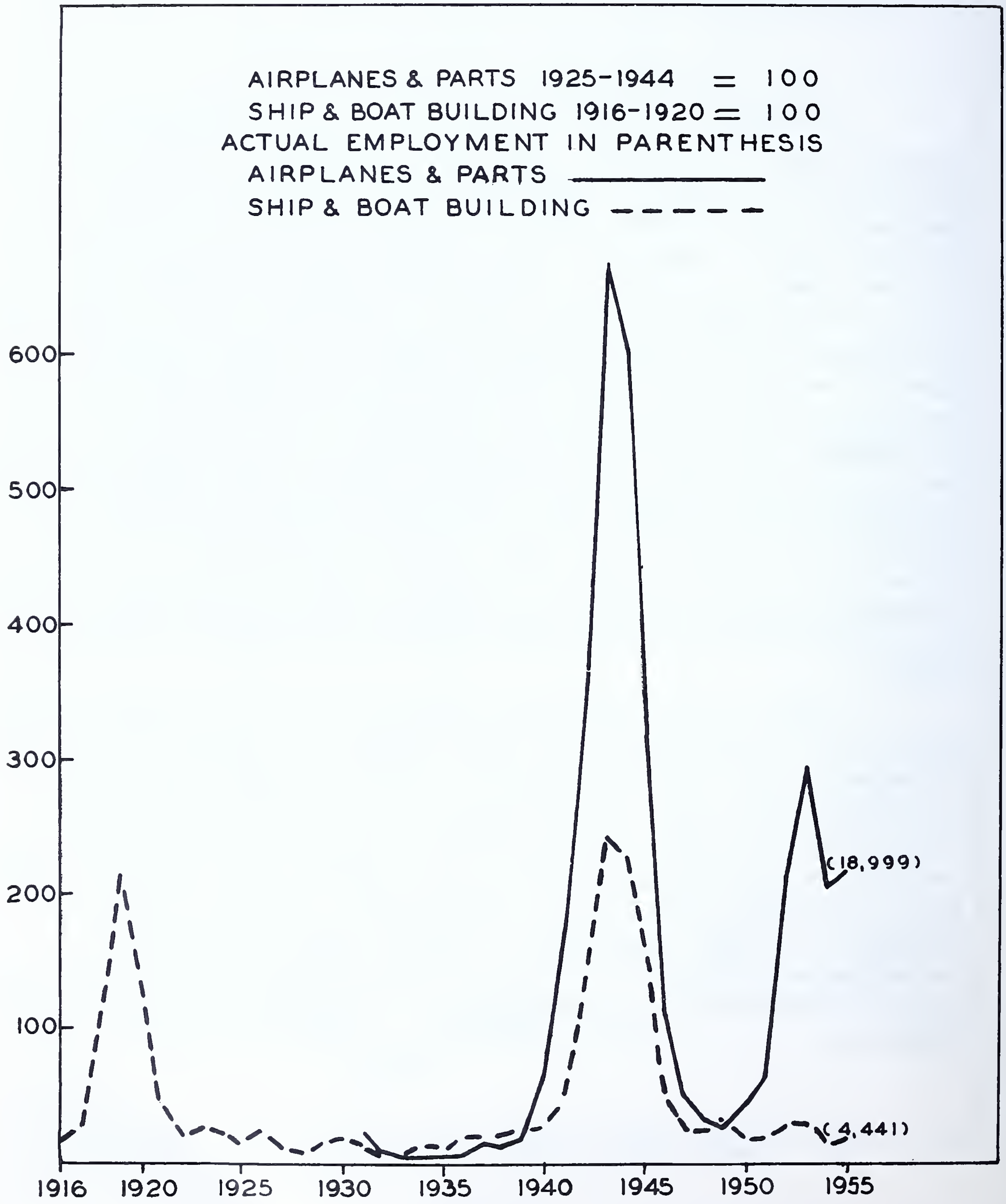
years, the adjustment has proved, so far, to be extremely difficult for sections of the State and Nation particularly affected.

* * * * * * * * * * *

The principal increase of employment in the non-ferrous metals group has been due to important additions to the State's capacity for the fabrication of aluminum, magnesium, beryllium and their alloys. Supplementing this remarkable expansion in the field of the light metals has been a parallel expansion in the application of the many types of stainless steel to structural, industrial and domestic products. The rise in labor demand in the newer types of production, both in the ferrous and non-ferrous fields, indicates strongly that future employment opportunities have come to depend less and less on the primary industries and more and more on their secondary derivatives. The production and distribution of consumers' goods is the ultimate aim of all industry, but in this process the primary metals are being used with increased economy and produced, in normal times, with greater mechanical efficiency. Variety is the keynote of the world which has been created on the foundation of iron, coal, steel and concrete, and the testimony is unmistakable that only through the acceptance of this variety in demand can any assurance of stable employment conditions be looked for in the future.

Pennsylvania is particularly fortunate in the opportunity to employ its ferrous and non-ferrous metals industries in the manufacture of consumers' goods with every advantage of markets, transportation and raw materials. As a leader in the production of the stainless steels and as the birthplace of the aluminum industry in America, the State has available for its manufactures, in unlimited quantity, those metals and alloys from which a large part of the consumers' goods of the next generation is likely to be produced. Adapting these new and highly specialized materials to every line of production affords the outstanding opportunity now available to the great metal manufacturing centers of the Commonwealth.

# MISCELLANEOUS PRODUCTS
# INDICES OF EMPLOYMENT



STATE PLANNING BOARD
CHART XXIII

## MISCELLANEOUS PRODUCTS - Charts XXIII and XXIV

Under this heading are grouped such unlikely associates as coke production, ship and boat building, and airplane manufacture as well as a large number of minor industries in some of which Pennsylvania's output stands first in the Nation.

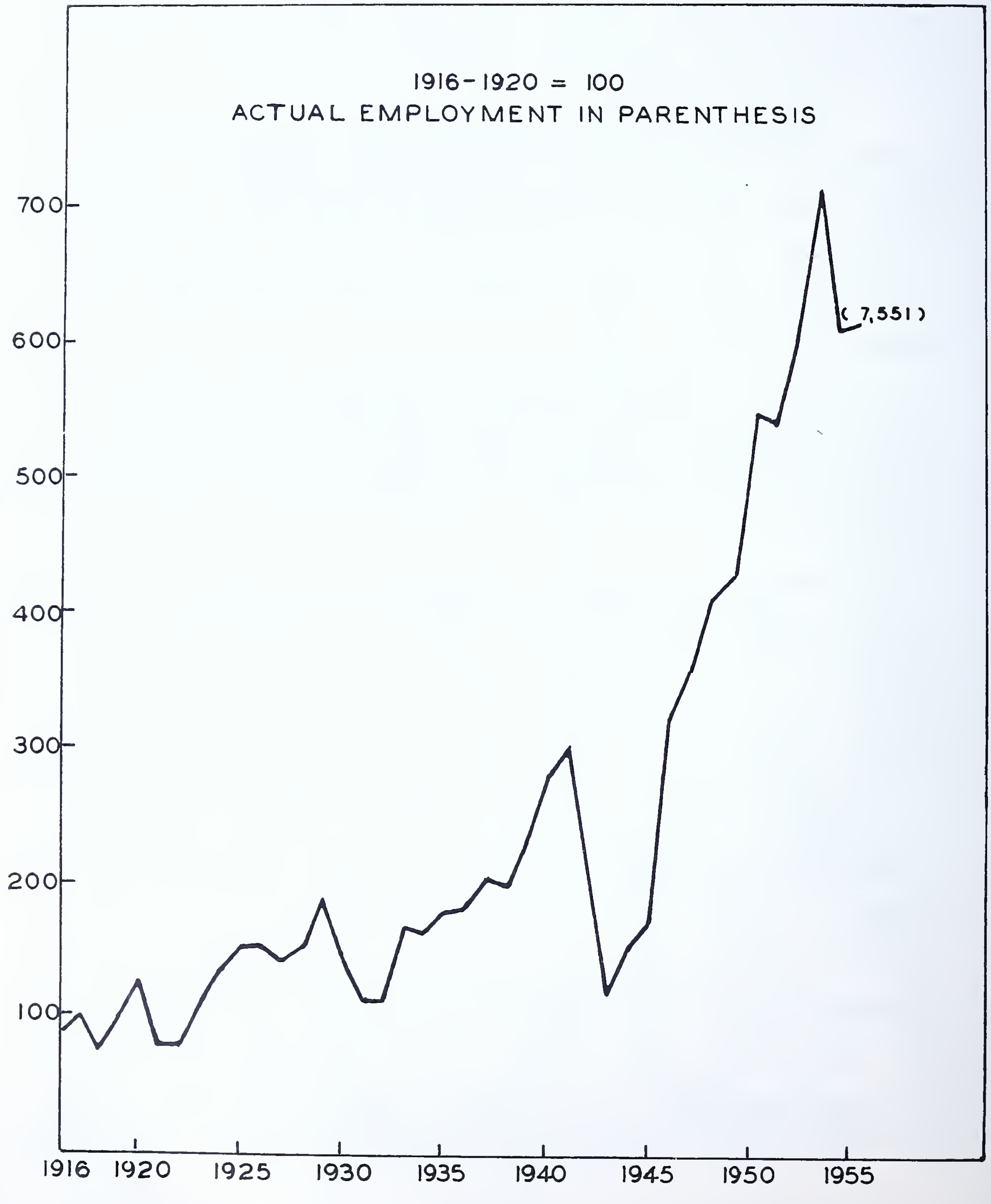
The range of these industries is quite broad. It includes, the manufacture of artificial flowers and plumes, asbestos products, baskets, brooms, brushes, buttons, cork products, curled hair, dental supplies, rubber stamps, house furnishing goods, mattresses, oil cloth, optical goods, lead pencils, photographs, pianos and organs, signs, sporting goods, statuary, storm windows, toys and games, umbrellas, window shades, as well as the operation of laundries and dyeing and cleaning establishments.

Both the airplane and shipbuilding industries, as is illustrated in the accompanying chart, are violently stimulated by war, and as a consequence employment in those two types of production showed extraordinary growth during the Second World War. Shipbuilding was also equally stimulated during the First World War, when airplanes were relatively unimportant.

The Korean War did not greatly stimulate shipbuilding which had already produced more than enough tankers for our normal needs, or even for the requirements of a minor conflict. On the other hand, the manufacture of airplanes and parts exhibited a second dramatic rise in employment up to the year 1955 when our present record ends. How remarkable the rise of the airplane industry has been in Pennsylvania, where our manufacturers have concentrated on light personal planes and on helicopters, as well as on the production of a number of essential plane components is shown by the employment record. In 1933, 355 workers in Pennsylvania were engaged in the aircraft industry. Ten years later the number had risen to 57,807. Employment dropped to 2,376 in 1949 and rose again to 19,000 in 1955.

Ship and boat building in which employment had risen from 5,560 workers in 1916 to 64,906 in 1919 in the heyday of the Hog Island yard in Philadelphia, fell again to 2,546 in 1933, rose to 73,309 in 1943, reached a low of 3,800 in 1950 and rose again to 4,441 in 1955. The course of employment in the shipbuilding industry was predicted in the State Planning Board publication of September 1944, written when

# TOYS AND GAMES
# INDEX OF EMPLOYMENT



STATE PLANNING BOARD
CHART XXIV

more than 68,000 workers were engaged in the industry. The report observes that "Shipbuilding has suffered more severe fluctuations during the past quarter of the century than any other in the entire range of Pennsylvania's industries. There are many reasons for this condition. The principal one is, of course, that in the type of global warfare in which we have twice been engaged in the past generation shipping is of prime importance and the position of the Philadelphia-Chester-Camden area with its access to the State's great steel mills permits a tremendous expansion in shipbuilding capacity. But ships are durable goods, expensive to construct and sufficiently valuable to their owners to be handled with all possible care. They last a long time, and no peace-time needs which have ever developed compare to the load thrown on ocean transportation by the launching and provisioning of a great expeditionary force.

"As soon as submarine operations become only a minor menace, American shipbuilding capacity is always so great that in the closing years of a war it constructs enough bottoms to supply the Nation's peace-time needs for many years to come. Shipbuilding then becomes largely a matter of supplying liners, small vessels, and pleasure boats and employment sinks to an irreducible minimum. If this phenomenon was observed as a consequence of our somewhat brief engagement in World War I, it appears likely to exist again in an even more exaggerated form at the close of the Second World War. While certain areas in Pennsylvania will be affected by this condition, it is likely that in some of our West Coast states, where shipbuilding has assumed a dominant place in industry, the effect will be extremely severe. The airplane industry, which has now attained a dimension never known in the world before, is likely to experience a similar decline in employment."

That the airplane industry after its decline to a low point three years after the close of the Second World War should suddenly be stimulated by a second conflict which did not require heightened activity in shipbuilding was, of course, not foreseen in 1944.

One component of the miscellaneous industries group which illustrates the competitive struggle between types of industries is that of laundries and dry cleaning. Here the progress was remarkable during the first thirty years of the State's record. The average number of workers in 1916-1920 was less than 10,000. It had reached nearly 20,000 by 1930, when the depression, which affected laundry operation less than almost any other industrial activity, slightly reduced employment during the next seven years. Following 1937 a ten-year growth in the industry led to a working force of 25,690 in laundries, dyeing and dry cleaning establishments. Part of this growth was undoubtedly due to a growth of population, but an important stimulus to the laundry and dry cleaning business was the great increase in the use of light-colored clothing by men during our semitropical summers. Increased employment of women in industry and commerce also transferred a considerable amount of domestic washing to commercial establishments. Meanwhile, however, the invention and improvement of home laundry equipment was slowing this rise, and finally overtook and passed it. After 1947, as the domestic market became abundantly supplied with washing machines, dryers and ironing devices employment in the laundry industry declined for six years but was up again to 26,557 by 1955.

One component of the miscellaneous industries group illustrates the very unusual expansion of employment in a very old industry, the manufacture of toys and games. Here, except for a brief decline during the war, the combined influence of greater leisure, the rise in the birth rate and the increased income available for amusement devices for young and old caused an almost meteoric rise. In 1916, 1,027 employes in Pennsylvania produced toys and games valued at $1,227,000. In 1955 the value of production of 7,551 employes in that industry was $62,441,300. This increase during the thirty-nine years of record of 6.7 times the 1916 number of employes and 50 times the value of product illustrates the fact that it is not only in such entirely new branches of manufacture as the construction of radios and electronic devices, air conditioners or helicopters that industrial opportunity is provided. The manufacture of games or amusement devices similar to those of which specimens are found in the tombs of the Pharaohs or the kitchen middens of the Swiss lake dwellers, still provides abundant opportunity for energy and enterprise.

Coke production has been discussed under the Chemical Industries, where it seems more properly to belong than in this miscellaneous classification.

## PAPER AND PRINTING - Chart XXV

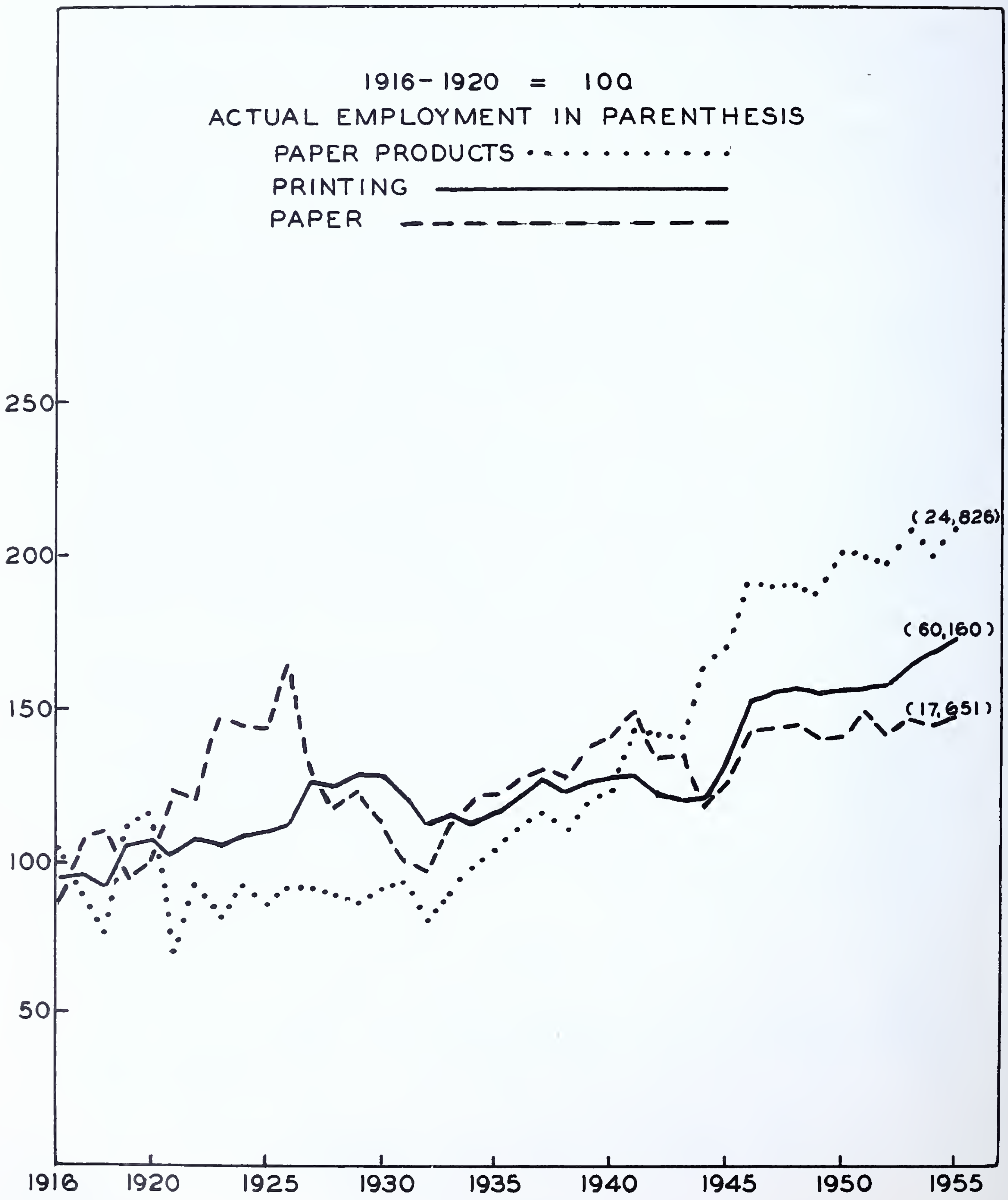
This industrial group, approximately 100,000 workers, has three principal components--printing, paper manufacture, and the manufacture of paper products. Printing and publishing is by far the most important of the three. It accounted in 1955 for 60,160 employes, the manufacture of paper products for 24,826, and the manufacture of paper 17,651. All three of these components of the industry have registered an upward trend since 1932, but the paper industry has never regained the employment level of 1926, in part because of progressive mechanization.

In Pennsylvania, there are several important centers of printing and publishing, among them - Philadelphia, Harrisburg, Lancaster, Scranton, Wilkes-Barre, Pittsburgh and Williamsport. Historically, these cities were active early in the development of the printing trades and have continued their dominance in the State through several generations. It is natural that certain branches of this industry, such as job printing and the publication of newspapers, should be directly dependent on population density in the surrounding areas. This is not, however, true of book publishing and the long continued success of certain Pennsylvania periodicals issued in comparatively small cities has demonstrated that one important phase of publishing is dependent for its prosperity only upon individual enterprise.

Employment in printing has increased with few serious set-backs from 32,860 in 1918 to 60,160, already referred to as the total for 1955. There is a wide range of establishments from small job printers to the publishers of weekly newspapers, of great metropolitan dailies and of books and magazines known wherever the English language is spoken. Few industries are more competitive, and few more appealing to those who, with the requisite training and skill, desire the independence of an establishment of their own.

The paper products industry, since it includes packaging material and many other products dependent on industrial activity, shows a greater rise percentage-wise than any other component of this group. The 1916 to 1920 average employment was 11,830, which has more than doubled in the ensuing years. The largest increase has occurred since the close of the Second World War. From 16,688 in 1943, employment rose to 19,312 in 1944, to 20,000 in 1945, to 22,683 in 1946 and has gained more slowly to the 24,826 recorded in 1955. The manufacture of paper is

# PAPER AND PRINTING INDUSTRIES
# INDICES OF EMPLOYMENT



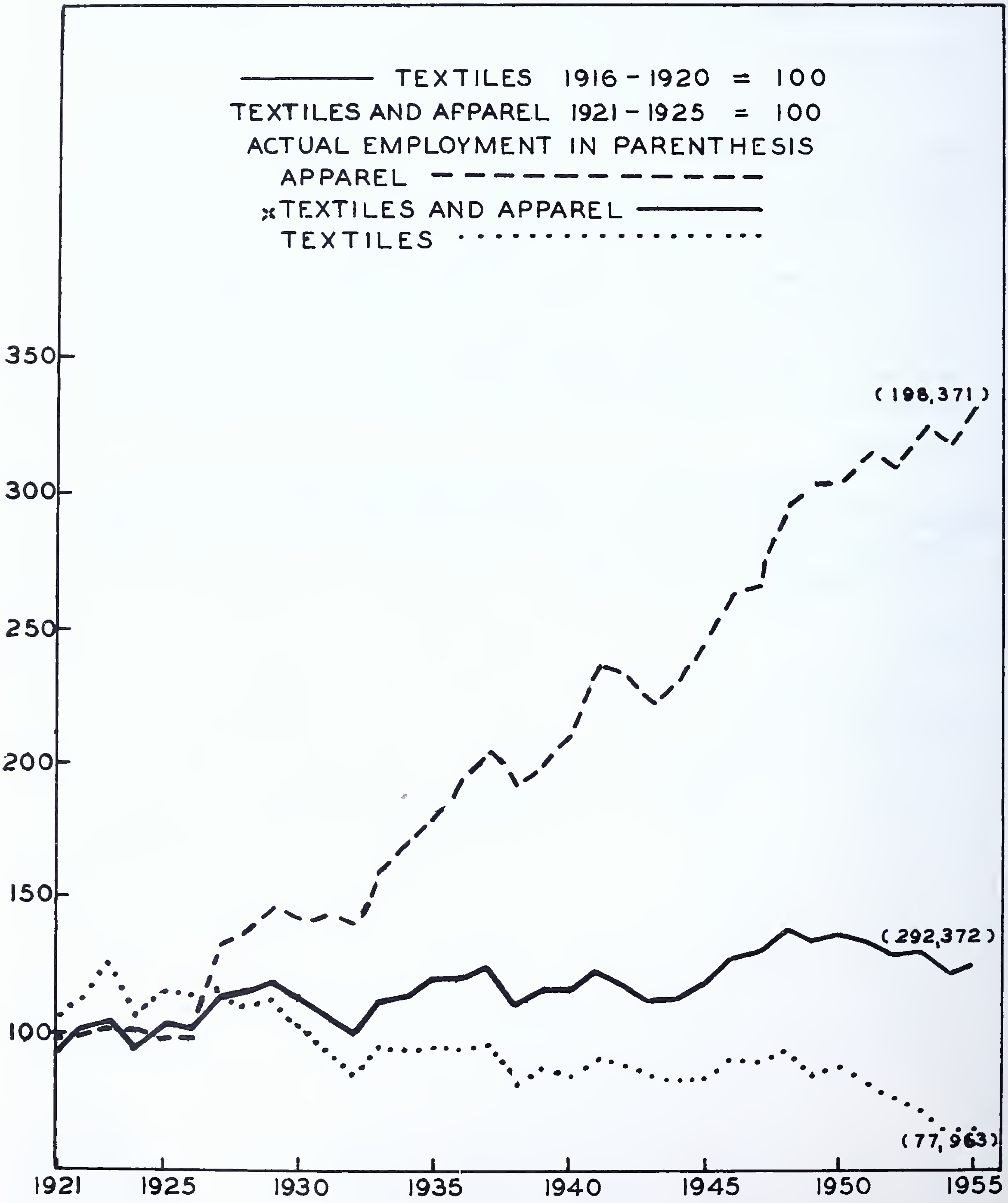
STATE PLANNING BOARD
CHART XXV

largely conditioned by available sources of wood pulp and other raw materials brought into the State principally by water, as in the thriving paper industries of Erie, Chester and Philadelphia, or through the use of available supplies of pulpwood in our northern counties.

In Elk, Clinton and Lycoming Counties in the heavily wooded area of the State, and in our southeastern counties, York, Lancaster, Delaware and Chester, the manufacture of paper and paper products provides substantial employment. The counties in which neither paper nor printing require as many as 100 employes are generally counties of small population which cannot support local newspapers of large circulation, or they are areas of somewhat limited commercial activity so that the demand for job printing is relatively slight. With these exceptions, employment in the printing or paper products industries is more general and more widely diffused than in any other type of industry so far considered.

Naturally, however, the large publishing activities in Pittsburgh, Philadelphia, Scranton, Wilkes-Barre and Harrisburg and the large paper mills of Erie, Elk and Clinton Counties have produced a concentration of employment in those areas.

# TEXTILES
# INDICES OF EMPLOYMENT



* HOSIERY INCLUDED
SEE CHART VII

STATE PLANNING BOARD
CHART XXVI

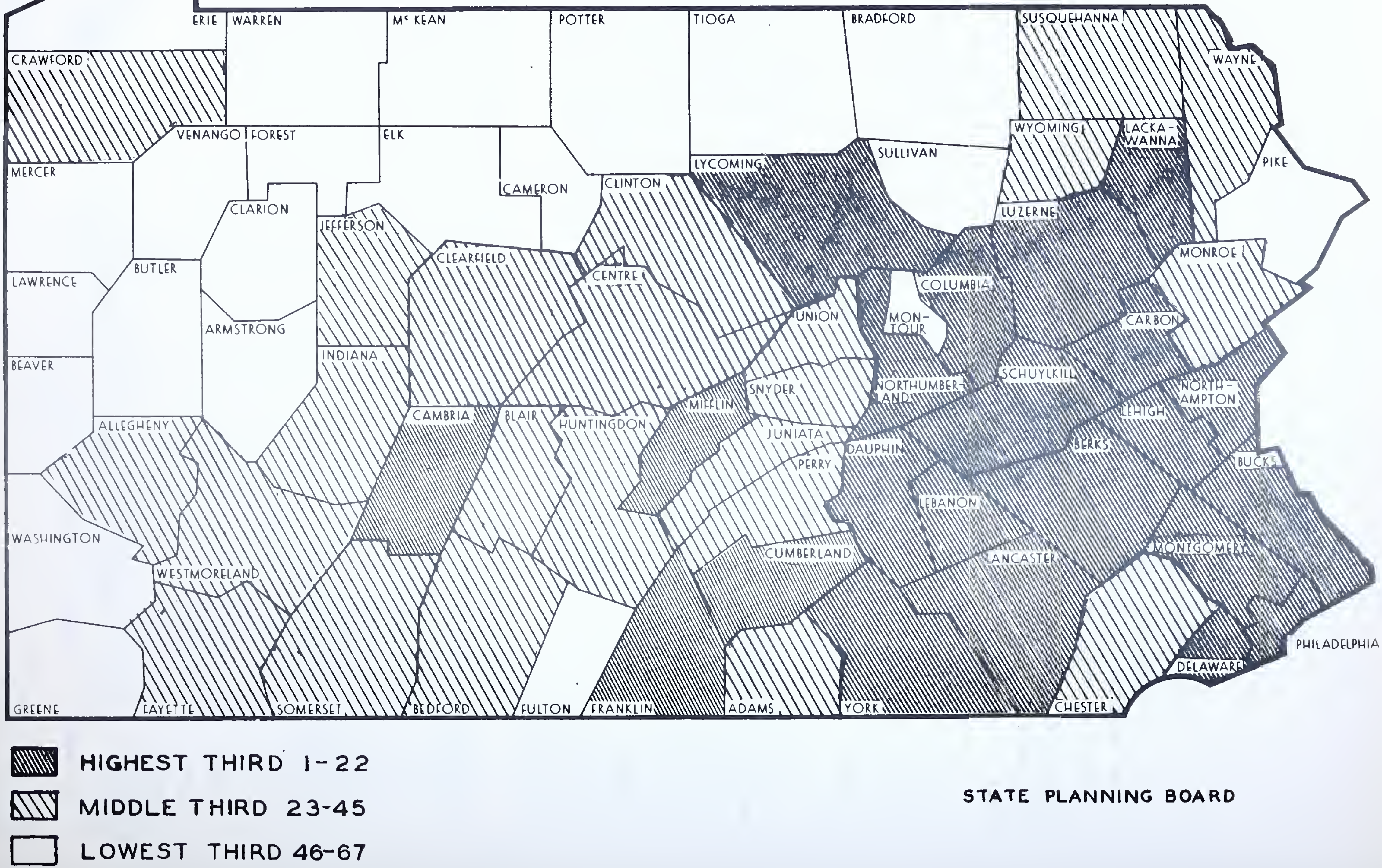
## TEXTILES AND APPAREL - Charts VII and XXVI

Employment in the textile industry in Pennsylvania, as recorded in the accompanying chart, has exhibited a greater stability than has any other general classification of industry. In 1916, 14.0% of the total industrial employment in Pennsylvania was in this field. In 1955, the percentage was 17.8%. The decline from the 1929 peak to the depth of the depression in 1932 was considerable, but proportionately was less than that of any other industry but the food group. During the 1930's, textiles and the food industries provided a fair degree of stability to Pennsylvania's employment record, and though employment in textiles and apparel has declined from 317,000 in 1930 to 292,000 in 1955, the level of the industry over the past seven years is well above that in any other period since 1920.

In times of high industrial activity and years of war, the percentage of the State's employment accounted for by textile and apparel manufactures is normally lower than in years of depression. From 13.3% in 1918, the percentage of textile employment rose to 16.1% in 1921, fell again in 1923 and rose to 22.7% in 1933. It is typical of the high industrial activity of the past few years, marked by an accelerated demand for metal products and by the heightened post-war construction activities and the parallel boom in automobiles and home appliances that the percentage of employment in the textiles declined to 17.8% in 1955, as noted above.

The two principal components of this industry, weaving and the knitting of hosiery on one hand, and the manufacture of apparel on the other, have had, of recent years, a somewhat different history. Employment in the manufacture of woven textiles, including broadloom silks, began to decline after 1929, and is now at the lowest level since 1916. In the manufacture of full-fashioned and seamless hosiery, an industry in which Pennsylvania was for many years the leading state in the Nation, a serious decline occurred during the period when imported silk thread was replaced almost universally, first by rayon and then by nylon. Competition within the industry became increasingly severe, and a considerable number of the State's hosiery plants closed down, or were transported to sites in the southern states. (Chart VII) Meanwhile, the apparel industry grew steadily in importance. From 59,000 employes in 1926 with very little decline during the serious depression of the 1930's the number of workers passed 100,000 in 1934, reached 157,000 in 1946,

# EMPLOYMENT IN TEXTILES & TEXTILE PRODUCTS
## 1955



STATE PLANNING BOARD

and has since steadily mounted to 198,000 in 1955, the latest year of record. It is worth noting that in both hosiery manufacture and weaving, technological unemployment was a continuing factor in the levelling off of work opportunities and that it is only in the hosiery industry that the outward migration of plants has been of decisive importance. On the other hand, in the manufacture of apparel which includes a large variety of products such as caps, corsets, men's and women's clothing, gloves, hats, knit goods, neckwear, shirts, suspenders and underwear, the nature of the products has, so far, limited the possibility of machinery replacing handwork in a drastic way.

The accompanying map showing the distribution of textile employment in 1955 makes it quite clear that the eastern section of the Commonwealth has a virtual monopoly in this type of manufacture and that, with the single exception of Crawford County, the northwestern counties have made very little progress in this industry. Six counties, Elk, Forest, Venango, Clarion, Fulton and Armstrong report no employment whatever in the textile manufactures. This concentration of textiles in the east is in part historical. In the early settlement of Pennsylvania, before the existence of either coal or iron was more than suspected, spinning and the knitting of hosiery or the weaving of cloth from wool and flax were natural and essential industries. The tradition was carried to what are now Berks and Northampton Counties by Pennsylvania German settlers and the importance of the skills and traditions established in those early years has been emphasized in the neighboring anthracite counties by the fact that coal mining, the region's principal industry, employed only men, so that a large number of women were available for the labor market. Unquestionably, the apparel industry, despite its unfortunate early association with child labor and excessive hours of work, has contributed toward stabilizing employment conditions in eastern Pennsylvania. On the other hand, the relatively low wages paid to women in the needle trades has served to depress the per capita income in many of our eastern counties as compared to western counties where the principal employment is in the highly skilled and highly paid metals manufactures with their preponderance of male labor.

One of the most warmly debated subjects of recent years in the industrial field has been the cause of the migration of certain types of manufacture from the Northeastern and Middle Atlantic states to the South. A gradual decline in the output of the northeastern cotton mills has been accompanied by a rapid expansion of cotton weaving in southern states, while Pennsylvania, which for many years had led in the production of full-fashioned hosiery, has yielded first place to North Carolina.

New England has suffered most in this southward migration of industry. Pennsylvania, particularly in certain sections heavily dependent upon hosiery manufacture, has been badly hurt and the fear has been expressed that the velocity of such migrations might continue to rise. There is no recent evidence that this is true, and studies undertaken, particularly one by a Textile Study Committee representing leading manufacturers, labor authorities and public utilities of Pennsylvania, have not found evidence that any single cause for this southward migration could be isolated.

It is human nature to search for the one effective cause underlying any change, whether in the physical sciences, in economics or in sociology. In a few instances, such causes have been discovered, but only very rarely can they explain social or economic consequences. What seems to be true is this: over the course of the years, changes gradually occur and conditions favoring a development of certain sites for industry are radically altered. One instance of such a change is the replacement of water power by steam power and then by electricity in the operation of spinning and weaving mills, and the consequent loss of the once overwhelming importance of the power resources presented by swiftly rushing New England coastal streams. When such a change gradually occurs, established mills with local associations are very reluctant to move to other locations. The pressure for lower costs and more favorable working conditions, together with the loss of the advantage of hydraulic power, was permitted to build up until a somewhat explosive condition occurred. Northern cotton mills, with multi-story structures and often operated with old and inefficient machinery, were faced with the necessity of reducing operating costs or closing their doors.

At this point many factors can be considered to have had some bearing on the trend of migration to the South. Among these were the desire for better access to raw materials, the contrast of a milder climate, the necessity for replacing obsolete buildings at possibly lower construction costs and, perhaps more important than any of the rest, the mere desire for a change from a location in which the struggle to maintain a competitive position had grown increasingly difficult. Newcomer enthusiasm in many Southern communities for industrial employment where it had never before been known may also have proved attractive. Communities in the South eagerly welcomed industry, whereas in the North, where the textile industries had been in operation for 150 years, the opportunity of industrial employment was perhaps too much taken for granted. The resulting movement of the cotton mills to the South was somewhat similar to what has occurred in Pennsylvania in regard to full-fashioned hosiery. When the Second World War cut off the importation of raw silk from China and Japan and the famous silk train stopped running, the replacement of silk by rayon, then by nylon, in both weaving and knitting plants forced many readjustments in plant operations. Cost items were scanned more narrowly than ever before. For a while, lower labor costs in the South provided a strong temptation for the Northern mills, but many other factors were operative and much of the movement of the hosiery mills to the South occurred after the labor cost differential had become less significant. Again many of the factors were undoubtedly psychological.

The effect of taxes as a motive for migration has never been established except in isolated instances. Power costs seem in most operations to be far from a decisive factor. The undoubted welcome which Northern plants received in Southern communities established a favorable climate for industrial location. The reported eagerness of Southern factory employes to master machine operations, the general attractiveness of a new location with a modernized plant, constructed at a minimum cost, and in an environment not associated with the normal historic problems of an operating business all undoubtedly had some influence on this movement South.

A further and more deliberate weighing of the relative advantages of Pennsylvania as compared with other states in the West and South has frequently checked the impulse to a change in location. Where access to markets or fuel resources are important factors, a Pennsylvania location has proved generally attractive. The gradual unionization of Southern mills has limited the appeal of cheap southern labor. It is clear also that new-comer enthusiasm is not likely to last over the longer term. Responsible proprietors of industries, both in the North and South, have in many cases considered that a tax advantage offered as an inducement to industry can rarely be maintained without either impoverishing the community which provides it or lowering the general standard of services available to a company and its employes.

The efforts of Southern communities to build up their industrial potential is fully understandable when it is considered that the income per family in several southern agricultural states is only half that in many locations in the North. In the long run the development of southern industry will provide markets for northern industry and accelerate the progress of our national economy to the benefit of us all. Pennsylvania, like any other state, has its particular advantages for industrial growth and the fact that for a number of years its industries have spent more for plant expansion and improvement than those of other states, is ample evidence that these advantages have not been lost.

## TOBACCO PRODUCTS - Chart VI

The chart of the tobacco industry closely follows that for cigar making, its principal component in Pennsylvania, (see Chart VI, chapter one). Other forms of tobacco preparation are of relatively minor importance in the State. The cigar industry, while growing in volume of product, has been very extensively mechanized and the downward trend of employment shown in the chart reflects an increased volume of output per worker. More than any other of the leading manufacturing groups, cigar making is limited to a relatively few counties. A heavy concentration of manufacture in this field exists in Philadelphia, Lancaster, York, Lehigh, Luzerne and Lackawanna Counties though the industry is of some importance in Bucks, Berks, Adams, Dauphin, Northumberland and Centre. In 45 counties of the State neither cigar making, nor any other form of the tobacco industry, offers any employment.

Production per worker rose rapidly from the beginning of the record in 1920 to 1940, and has been rising slowly from 1940 to the latest reporting year. The result of this technological improvement is shown by a comparison of the records of output and employment in 1920 and 1954. The average production in 1920 was 57,000 cigars per year for each worker. By 1954, this output had nearly tripled, the total being 160,000 per worker per year. The reaction of this increased productivity on employment has been considerable. The average number of workers from 1916 to 1920 was 31,200. The present level is 16,000, less than half that of a generation ago.

While there are now in operation a number of cigar factories producing hand-rolled cigars for the upper price range, it is reasonable to assume that the coming years will witness a further change-over from the hand-made to the machine-made product, and that this change will still further increase the production per employe, and could possibly continue to reduce the total number of employes, if cigar smoking does not rise in public favor.

The fact that Lancaster County annually leads the Nation in its output of cigar leaf tobacco, and that Lebanon and other neighboring counties in the southeastern section of the State are also important in this agricultural product has undoubtedly tended toward that specialization on cigar making now a characteristic of the State's tobacco industry.

From 12th ranking industry in employment in 1930, cigar making declined to 18th in 1940 and stood 23rd in 1955. In that year, there were 99 cigar factories in Pennsylvania and their product, both in volume and value, exceeded that of any other state in the Nation. The other products of tobacco provided, in 1955, a total employment of 560. Six small plants were engaged in the manufacture of stogies.

The State has one cigarette factory, 15 plants producing smoking and chewing tobacco, while 8 plants were unclassified as to product. Most of these are engaged in stripping tobacco (taking out the stems, preparing the leaf for manufacture and processing the dust and stems for agricultural use as an insecticide).

## THE RAILROAD REPAIR SHOPS IN PENNSYLVANIA

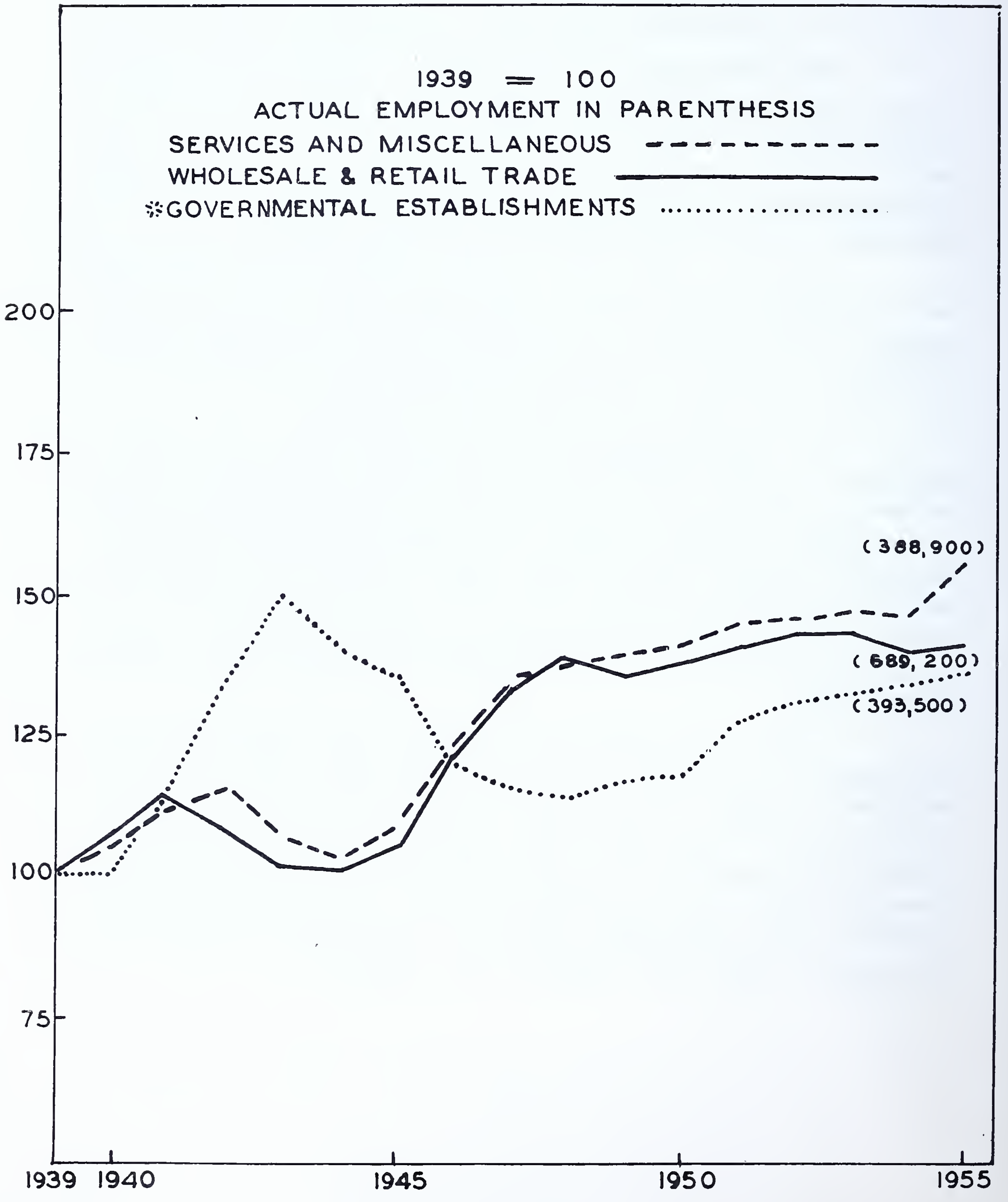
One classification of Pennsylvania industry, the extensive railway repair shops maintained in many of our counties has the characteristics of both a service and a manufacturing enterprise. These shops perform work of immense value to our railroads in maintaining their rolling stock in good condition, and in the construction of many types of equipment. The railroads could not exist without them.

In 1955, they employed 33,948 workers of all categories and in 1955 employment was well below the recent average for this industry (44,217 in 1953). The product of the shops in 1955 was valued at $226,561,700, while compensation for all employes was $137,628,700, a very considerable decline from $171,966,500 in 1953.

The industry is sensitive to the prosperity of the Nation's railroads, but 1932, which was the worst year for employment in many of the State's industries, was well above 1938, the poorest year on record in the number of workers engaged in the repair of railroad equipment. Except for the banner year of 1951, wages in 1953 were the highest so far recorded (1954 wages $107,879,700). So, too, has the value of production ($293,000,000). The average annual compensation for employes which was $1,039 in 1932, rose steadily to $3,889 in 1953, and to $4,054 in 1955.

In many of the counties of the State, only a handful of workers are engaged in the repair of railroad rolling stock, and in 14 counties there was, in 1953, no employment whatever in the industry. In one county, only two workers are listed. On the other hand, in Blair County 53.2% of all industrial workers were employed in the railroad shops, in Cumberland County 21.1%, in Clinton County 17.5%, in Bradford County 12.5% and 9.1% in Susquehanna County. In 17 counties, more than 2% of all industrial workers were engaged in this industry.

# TRADE SERVICES AND CONSTRUCTION INDICES OF EMPLOYMENT



STATE PLANNING BOARD
CHART XXVII

* INCLUDES TEACHERS

## EMPLOYMENT IN TRADE, SERVICES AND CONSTRUCTION - Charts XXVII and XXVIII

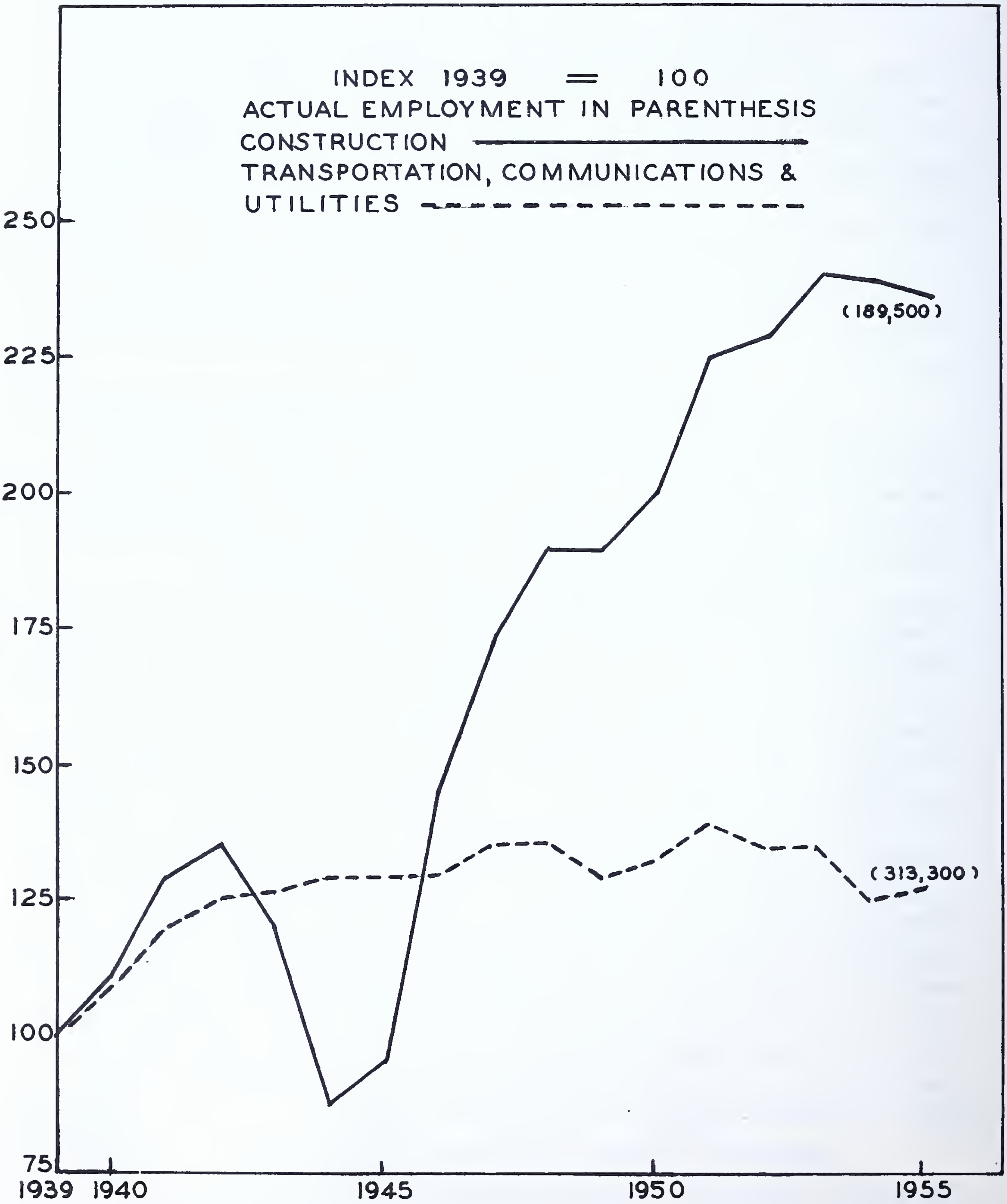
In addition to employment in mining and manufacturing, a record of the number of workers in various commercial and professional occupations is available in each Census and is also estimated monthly by the Pennsylvania Department of Labor and Industry. The maps showing employment in business and professional services and in wholesale and retail trades are very similar, and follow the general pattern of the distribution of population density and of manufacturing income. In other words, the demand for professional and business services, the volume of retail and wholesale trade, and the employment provided by mercantile firms are closely governed by the number of people within a given area and the value of their industrial production.

The two charts on the following pages illustrate the movement of an index series for several non-manufacturing industries (1939=100). On the first chart of the series, employment indices in retail and wholesale trade and in the service industries are shown to have followed a parallel, and at times an almost identical course, although nearly twice as many persons are engaged in trade as in the services.

This index is in sharp contrast with that for the total of local, State and Federal government employment in Pennsylvania which rose rapidly in 1940-1943 during the war and pre-war years, at a time when service and commercial employment was definitely declining. As government employment fell off to a low in 1948 because of the disbanding of military units, and a considerable decline in war-stimulated government activities, workers returned to trade and service industries. Since the close of the war employment in trade, service and government has steadily grown, but government activities have expanded at a somewhat higher rate than either business or the trades. The effect of war is also noticeable in the following chart, where construction employment is contrasted with that provided by transportation, communication and the public utilities. In the latter category, except for the recession of 1949, the movement has been more or less indecisive. Construction on the other hand spurted between 1940 and 1942, declined very sharply during the last years of the war then mounted rapidly upward and seems not to be rounding off.

Employment in finance, insurance and real estate has followed the general course of development shown in the service industries.

# TRADE SERVICES AND CONSTRUCTION INDICES OF EMPLOYMENT

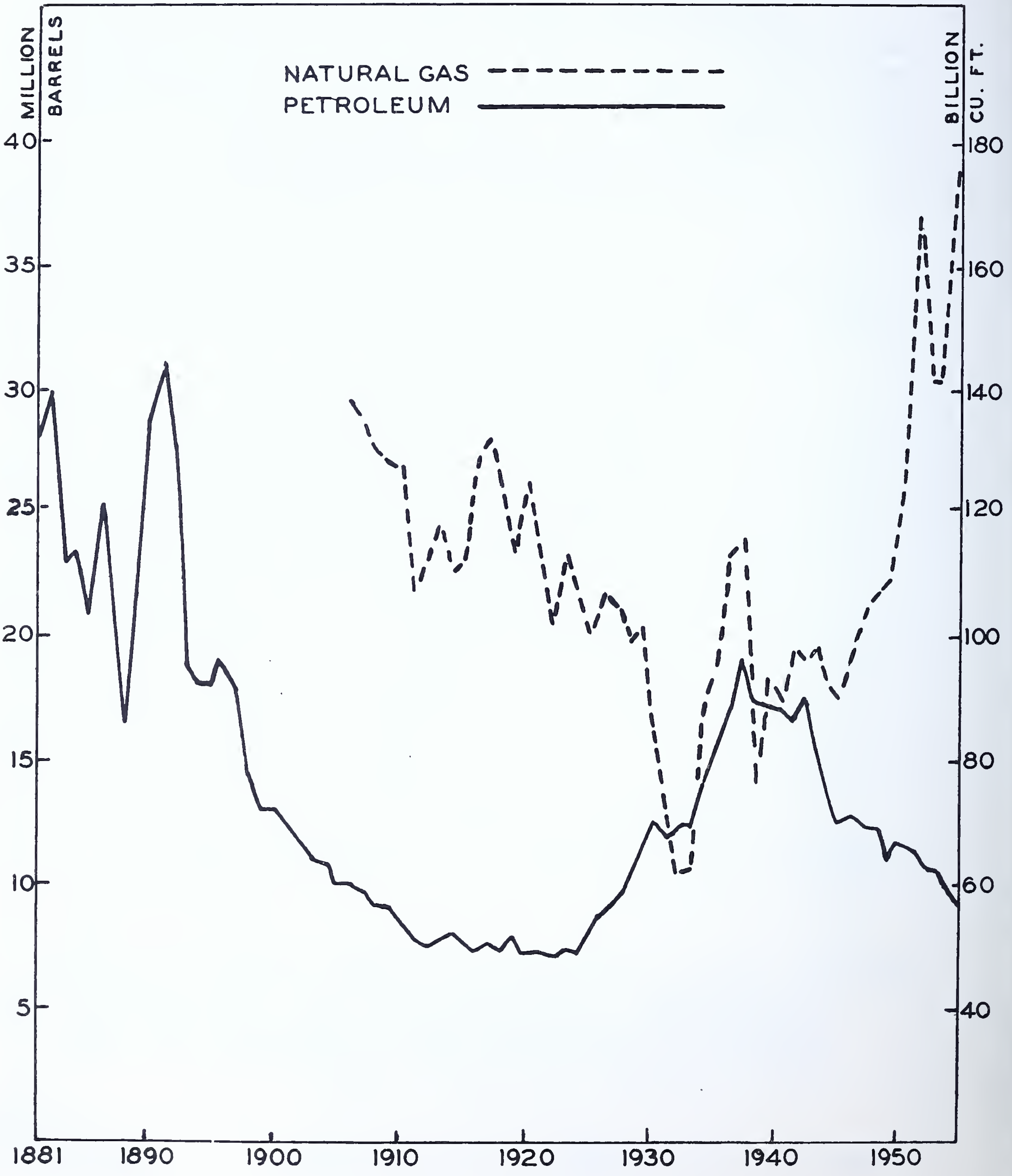


STATE PLANNING BOARD
CHART XXVIII

Of these several components trade is by far the most important employing 689,200 in 1955; second is local, state and federal employment, 393,500. Next are the service trades, 388,900, utilities and transportation, 313,300, construction, 189,500, and finance, insurance and real estate, 131,500. *

Note: The reports of the 1954 census of business show 479,784 employes in retail trade, of which number 387,476 were working a full week as of November 15, 1954. In addition, there were 126,027 proprietors of unincorporated retail establishments. Wholesale trade, as of November 15th, employed 164,946 workers.

# PRODUCTION OF NATURAL GAS & PETROLEUM IN PENNSYLVANIA 1881-1954



STATE PLANNING BOARD
CHART XXIX

## PENNSYLVANIA'S ENERGY RESOURCES - Charts XXIX and XXX

The pattern of Pennsylvania's industrial production is a resultant of many factors. Some are historic, such as William Penn's early interest in textile manufacture and others are based on the location of our Commonwealth, central to that part of the east coast of the United States on which European immigrants descended in huge numbers throughout both the 18th and 19th centuries. For some industries, however, the most potent influence on the State's industrial growth has been the strength of its natural resources including soil and climate and the abundant sources of fuel energy which became available to manufacturers early in the 19th century and have continued to provide ample reserves of power ever since their discovery. Most important historically and in overall effect, were the State's enormous resources of anthracite and bituminous coal. That coal provided fuel for the early American railroads. It has supplied both fuel and coke for the steel mills and iron furnaces, and finally has become the principal source of many basic raw materials needed for the manufacture of organic chemicals.

In an early section of this report, the changing fortunes of these coal resources have been briefly discussed. Coal is, however, not the only important source of energy developed in the Commonwealth, and this short chapter will be devoted to liquid and gaseous fuels, and to the State's electrical energy production.

Pennsylvania's position in the petroleum industry has changed during the past 100 years from that of the leading, and for a while the only producer of commercial fuel oils and gasoline to that of one of the great oil refining centers, operating largely on crude oil from other states or from foreign nations. Our native oil was, however, at one time of overwhelming importance. From 1859, when the first commercial production of "rock oil" in Pennsylvania, or in the world, began at Drake's Well near Venango, the State's output rose rapidly to a total of approximately 30,000,000 barrels a year, declined sharply again from 1882 to 1888 and reached a final peak in 1891, after which the exhaustion of the wells and the desperate wild-catting indulged in led to a decline almost as precipitous as the preceding rise.

By 1912, production had fallen to less than one-fourth of the peak output and remained at that level for more than 10 years. Heroic efforts on the part of Pennsylvania's oil men to restore the State's production, which had become relatively insignificant just at the time when the automobile industry had tripled and quadrupled the demand for gasoline and lubricants, led to the invention and legalization of a system of water pumping which forced oil up through the permeable sandstones and restored the flow of wells which had seemed hopelessly exhausted.

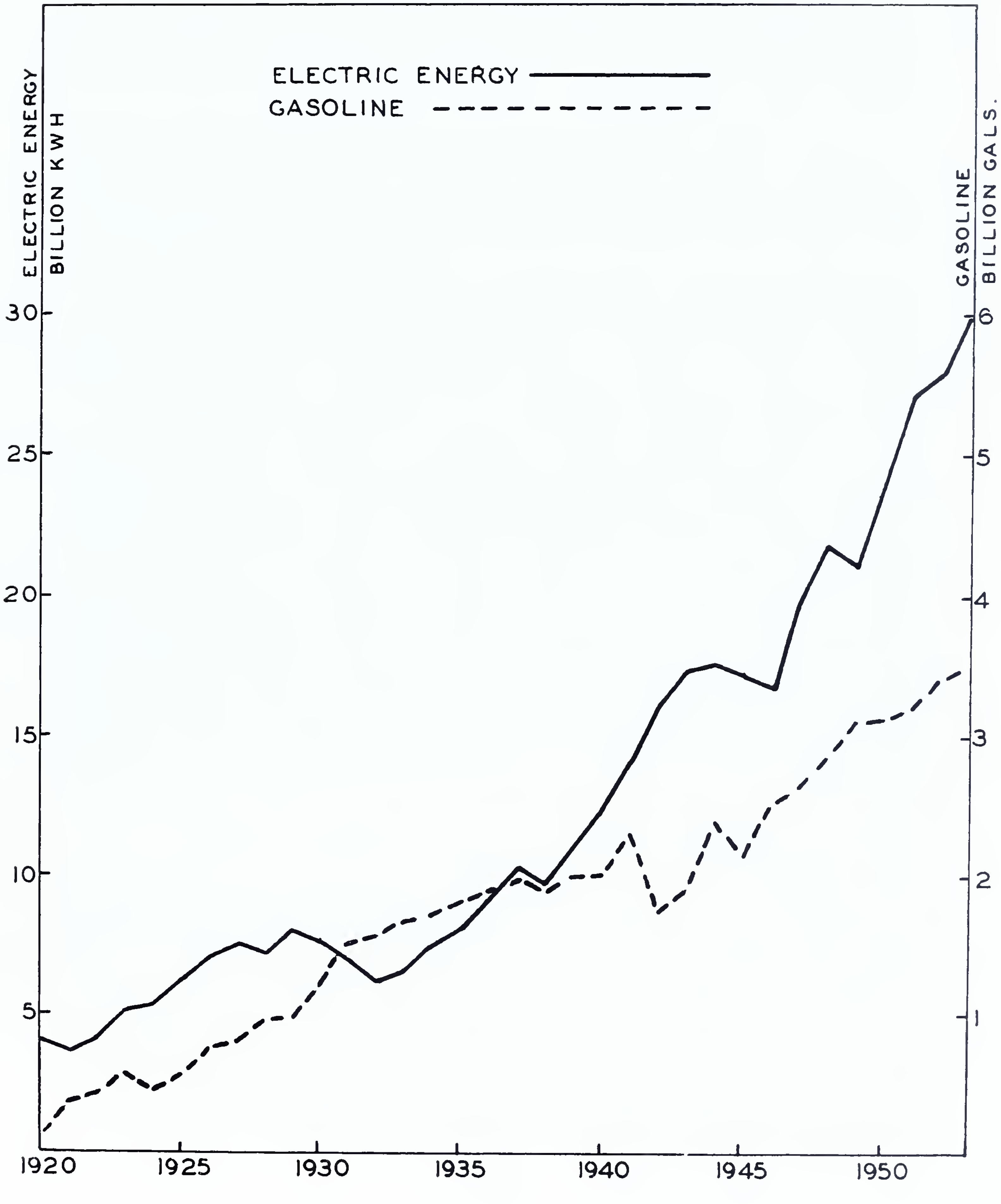
By 1937, production had mounted again to a total of more than 19,000,000 barrels which were sold for a price far higher than the 31,000,000 barrel output of 1891 had brought. Since 1937, however, the decline has followed a pattern similar to that experienced after 1891. Whether new methods of extraction will succeed in reversing once more the declining curve of output remains to be seen, but it is likely that the battle to recover all the resources of crude oil buried under Pennsylvania's hills will be continued for many years to come.

Several plans have been developed for mining the oil sands in certain sections of the Bradford field where the deposits lie close to the surface, but it is probable that Pennsylvania's production of native liquid fuel will ultimately depend chiefly upon the hydrogenation or gasification of its coal deposits.

Investigations made by a group of engineers, under contract with the Corps of Engineers of the Department of the Army, have led to an estimate that liquid fuel can be produced from the culm piles of the anthracite area through the gas synthesis process at a cost somewhat lower than from any other available coal resource in our Nation; and that Pennsylvania's recoverable primary reserves of both bituminous coal and anthracite suitable for liquid fuel production total 6,145,000,000 tons. It is, of course, not likely that these resources will be tapped while adequate supplies of petroleum are available from wells in our own and other nations. But even if the solar and atomic energies are tamed to supply the heat and power of the future, the chemical contents of coal and its derived liquid products insure the future importance of these precious hydrocarbons.

As a refiner of petroleum, Pennsylvania now leads all states on the Atlantic coast with an output, as reported by the Pennsylvania Department of Internal Affairs for 1953, of more than 3,500,000,000 gallons of gasoline and nearly 662,000,000 gallons of kerosene, an amount far in excess of consumption by the industries and automotive machinery of the Commonwealth.

# PRODUCTION OF ELECTRIC ENERGY AND GASOLINE 1920-1953



STATE PLANNING BOARD
CHART XXX

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Pennsylvania's natural gas production has, of late years, been considerably increased by two recent discoveries; one in the Leidy Field in Clinton County and another in the Driftwood-Benezette gas field in Cameron and Elk Counties.

In 1951, the State's output was higher than had been recorded at any time in the past generation though that peak output has not been maintained during the succeeding three years. Production does not, however, equal consumption, and has not done so since 1907, with the exception of 1935, 1936 and 1951. The State's estimated proved reserves, as of December 31, 1952, were calculated by the American Gas Association as being 515,866,000,000 cubic feet, which is approximately 0.4% of the national total. It is possible that the recent discovery of the two new producing fields mentioned above indicates the presence of further reserves, which might add materially to present known resources.

The principal economic importance of Pennsylvania's natural gas has been in providing fuel for glass manufacture, and a source of finely divided carbon for the electrode and carbon black industries. Natural gas, principally from western sources, has, however, of recent years, become an important domestic heating fuel in competition with petroleum and anthracite. This has been particularly true in suburban housing developments, where the relatively low cost of gas-burning furnaces has made their use attractive to speculative builders. In the eastern fuel market, natural gas has been used principally to increase the BTU content of gas manufactured by the controlled imperfect combustion of bituminous coal.

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For many years, the production of electrical energy by Pennsylvania industries for their own consumption has exceeded that of any other state. The total production of electrical energy in our State has, for many years, been second in the Nation, exceeded only by that of New York. The growth of electrical energy production has been remarkable. The State's total output for 1953 by both utilities and industries was 35,903,000,000 kilowatt hours, a large portion of which was generated by the combusion of coal. The State's utilities alone produced approximately

24,000,000,000 kilowatt hours in 1950 as compared with 12,500,000,000 in 1940, 7,800,000,000 in 1930 and 4,000,000,000 in 1920. Since 1950, the annual increase has exceeded that in any previous three-year period. The 1953 production of the State's public utilities was more than 30,000,000,000 kilowatt hours.

The gradual transfer from direct steam drives to electric power drives in most factories of our State and Nation is exerting a steady pressure toward the decentralization of industry, which is accelerated by other conditions, such as the growing congestion of urban streets and their feeder highways.

While steel production, glass manufacture, and other types of manufacture dependent directly on the heat units or hydrocarbon content of coal are likely to remain in locations as close as possible to the sources of their necessary raw materials, many of the motives which led to industrial concentration have not lost their urgency. The following sentences from a 1944 survey of Pennsylvania industry, by the State Planning Board, still summarize the general outlook: "While the industries of Pennsylvania have fortunately been spared the effect of bombing raids, it is fairly certain that other causes may diminish the tendency of large industries to huddle together along the water fronts of crowded cities. The effect of that significant rise in electric energy production which makes the industries of 1944 so different in methods of operation from those of 1918 will almost certainly become slowly apparent in the decentralization of many types of manufacture with a consequent improvement of living conditions for workers and a gradual decline in the traffic congestion which has frequently slowed the rate of industrial production and added to its cost in the past." *

In 1956, twelve years later, it is becoming apparent that these gradual trends toward decentralization are leading to a new industrial pattern and that, even in the face of a threat of widespread destruction in the event of war, it is still likely that traffic congestion and crowded living conditions will prove more powerful incentives to decentralization than the fear of enemy attack.

*See Appendix I

# THE PATTERN THAT DEFEATS DEPRESSION

At a period of high and sustained industrial prosperity for most of the area of our State and Nation, it may seem quite needless to look back to a time in our industrial history when things were not so bright. At the height of a boom many folk resent any implication that the rising curve of business activity could ever slant down. The history of the Nation and of the world is, however, against any assumption that economic forces always move in a favorable direction. It is, therefore, just as necessary, at a time of prosperity, to take reasonable precautions by building, whenever possible, the most stable economic structure, as it is to take precautions to defend our mode of life against external attack which we hope may never occur.

For this reason, in the concluding section of this report on Pennsylvania's industries, we are reprinting* a brief summary of facts as to economic stability revealed by the State's experience during the great depression of the 1930's.

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"Many lessons can be learned from the history of Pennsylvania's employment and industry during the ten years of the great industrial depression which began in the fall of 1929. A careful examination, county by county, of both the maximum and the average relief load developed during that dark period in our economic history reveals facts which are of positive value for the future.

"It will be seen, for instance, from a comparison of state-wide data as to the sources of each county's employment during that depression period that counties with the highest per capita income from agriculture almost uniformly stood lower than others in their average and maximum relief load. This correlation is positive and unmistakable. A prosperous agricultural background is the best assurance any county can have of its freedom from the most serious phase of industrial depression. A prosperous agriculture is a positive protection against a heavy relief load. This, however, does not mean that farming is, of itself, an unfailing resource in bad times. There is little or no connection between the percentage of a county's area in farm land and freedom from the heavy burden of unemployment and relief. It is only the value of the farm products, both absolutely and per capita, which offer that insurance.

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* "From Recent Industrial Trends and New Employment Opportunities" - State Planning Board, September 1944.

“A similar (though not quite so high) correlation exists between the number of sources of county employment including trade, farming, and the various classes of industry, and a low relief load. Counties with a high degree of diversification as determined by the number of important employment sources tend to have a lower relief load than counties in which the number and types of employment are more limited. The effect of such diversification is more certainly felt in those counties where the leading sources of manufacturing employment are in the production of consumer goods.

“These findings lead to conclusions which have already been discussed elsewhere in this summary. While many of the leading sources of the wealth of this State lie in its production of coal, iron, steel and other raw materials, it must never be forgotten that the destination of all produced wealth is the ultimate consumer. In times of stress and uncertainty he buys for his immediate wants only those goods which are necessary to his health and well-being and it is only by such purchases in times of doubt and temporary unemployment that the stream of our industrial life continues to flow. Farm produce and consumer's goods, such as clothing, shoes, material for repairs of existing machinery, and necessary household and transportation equipment provide continuous employment even in the very worst of times.

“Exceptional cases are certain to occur, but over the longer term counties with a comparatively large number of industries, balanced between producer and consumer goods, and with a solid background of productive agriculture have weathered industrial storms far better than any others.”

# APPENDIX

## THE PROSPECTS FOR EXTRACTING LIQUID FUEL ECONOMICALLY FROM BITUMINOUS COAL AND ANTHRACITE CULM

In March 3, 1952 a report was issued by Ford, Bacon and Davis, for the Corps of Engineers of the Department of the Army, detailing the results of an investigation covering the solid and gaseous fuel resources of the United States available for the manufacture of fuel oil and gasoline. The report covers the Nation's reserves of coal, natural gas, oil shale and oil sands. The interesting fact about this investigation is that the engineers conducting the survey considered suitability of these hydrocarbon resources for two types of synthetic fuel production, the hydrogenation process and the gas synthesis process, and estimated in detail the cost per barrel of liquid fuel from these various resources.

Pennsylvania solid fuels considered include anthracite from the culm banks of two general areas in the southern field and bituminous coal from the State's several fields. Tonnage of the available deposit, carbon content, ash, sulfur and BTU per pound were determined or estimated. Cost per barrel of product and per ton of coal necessary in each process was approximated for each area in Pennsylvania and in the United States. The comparisons are in general favorable to two low-cost areas in Pennsylvania. The estimated cost for coal needed is as low as $1.13 per barrel in the Beaver-Lawrence area (Hydrogenation process), rising to $2.20 in the Westmoreland field, and $1.22 to $1.30 per barrel using anthracite culm as a raw material, rising to $2.83 in the Westmoreland area for the gas synthesis process. The relatively low cost per barrel for liquid fuel produced from anthracite culm is due, of course, to low BTU, 8,340, estimated for the culm, and the relatively low cost of that raw material.

It is estimated that 23,000 barrels of liquid fuel is a supportable daily capacity for the gas synthesis process from anthracite culm, and that 256 million tons of culm are available, 142 million as a primary resource. For the Nation as a whole the estimated supportable daily plant capacity is 1,356,000 barrels for hydrogenation or 1,479,000 barrels for the gas synthesis process (synthine).

The report seems to indicate little present need for the development of atomic energy as a power resource for the United States, since the engineers conclude that the total tonnage of our Nation's recoverable coal available for the manufacture of synthetic liquid fuels amounts to 116,987,988,000 tons suitable for hydrogenation or 125,912,652,000 suitable for the gas synthesis process, the total for Pennsylvania being approximately 15 billion tons, of which 7 to 10¼ billion tons of primary and secondary reserves are in areas where both coal and adequate water supply are available. It is stated that presently useable national coal reserves can supply the estimated demand for liquid fuels for at least 40 years.

Finally, this engineering report maintains that for the gas synthesis process, Pennsylvania anthracite culm will yield the lowest total cost per barrel, $5.02, that one area of the Kentucky bituminous fields is second and one in Pennsylvania third with a total cost per barrel of $5.30.

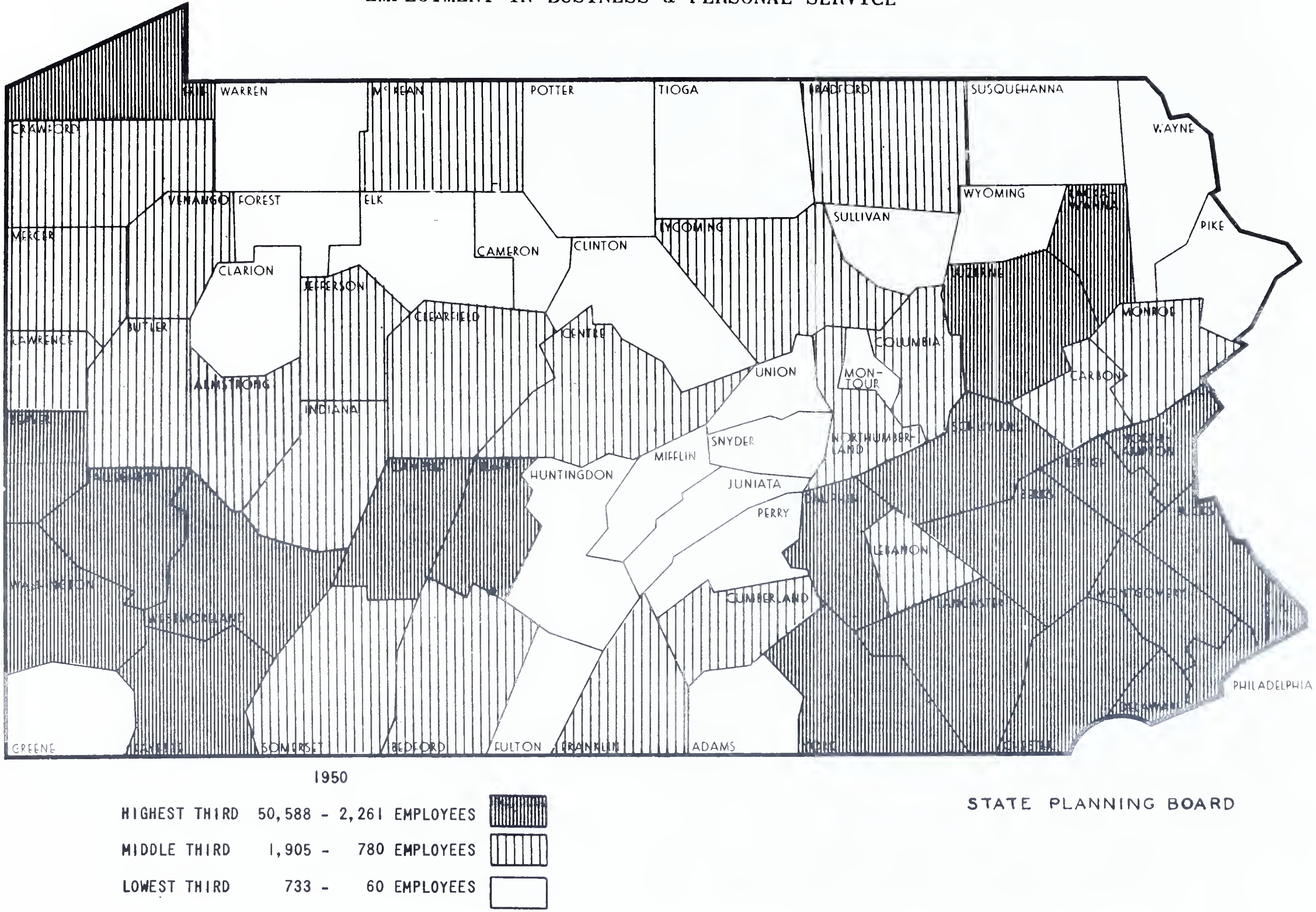
These comparisons may be of no immediate moment, but are possibly of considerable importance in assessing the long range outlook for the mineral industries of the Commonwealth.

(In the hydrogenation process coal is liquefied by combining it with hydrogen at high temperature and high pressure in the presence of a catalyst. In the gas synthesis or synthine process oxygen-enriched coal gas is produced and the resulting mixture of carbon monoxide and hydrogen is then exposed to a catalyst at a suitable temperature lower than that needed for hydrogenation. One difference in the requirements of the two processes is that the gas synthesis process is practically self-sustaining. It produces waste heat which can supply the power requirement of the process. Hydrogenation requires additional electrical energy which cannot be supplied by recoverable waste heat. It is calculated that for either process approximately 1,100 workers would be needed for plant operation at an output of 10,000 barrels a day and in addition, of course, from 900 to 1,000 miners must supply the coal if produced from deep workings, 300 to 400 miners if the coal is dug in strip pits, or some 370 if the fuel comes from the anthracite culm piles).

This optimistic view of short term (40 year) possibilities for the production of liquid fuels from coal is not supported for the longer term by recent surveys of American fuel resources by other investigators and particularly Eugene Ayres, co-author with C. A. Scarlott, of Energy Sources - The Wealth of the World, and Manager of Research for the Gulf Oil Corporation 1929-56. Mr. Ayres' estimate of fuel reserves (Scientific American - September 1956), based in part on a re-appraisal by the U. S. Geological Survey of our useable coal reserves, indicates that a production peak of coal may be reached by 1970. Ayres states that a consensus of the opinion of mining engineers indicates that the economic recoverable coal amounts to only one-tenth of the geologic estimates. Unforeseeable discoveries may, of course, change the outlook but Ayres believes that, even with full consideration of the effect of atomic energy and hydroelectric power in supplementing carbon as an energy resource, the world's energy demands may well exceed its production before the end of the 20th century. This means, of course, that during the normal life-time of children born since the Second World War energy hunger may become a much more acute factor in national and international affairs than it has ever been before in human history.

Early symptons of such a development are evident today and it is clear that, even over the shorter term, petroleum from United States wells will need to be supplemented by constantly increasing imports from abroad, or by the production of synthetic gasoline and fuel oil from coal and shales, since the annual demand for liquid fuels already exceeds our native supply by approximately five hundred million barrels, and is increasing at a current rate of seventy million barrels a year. To emphasize this difficulty is the fact that outside of the United States world demand for liquid fuel is increasing faster than supply.

# EMPLOYMENT IN BUSINESS & PERSONAL SERVICE



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